9459

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, ETC.

VOL. XCIX.

JULY TO SEPTEMBER 1907.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

1907.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. XCIX., No. 2303.—TUESDAY, JULY 2, 1907.

EDITORIAL NOTES—GAS, &c.

Carbonization—A Large Inquiry.

THE merest glance at the last few issues of the "JOURNAL" will convince the members of the Committee appointed by the Council of the Institution of Gas Engineers to consider the question of carbonization, that the reference to them, while it will be interesting and instructive, is at the present time by no means an enviable one. The questions and problems involved are in a chaotic and transitory state, are all far-reaching in character, while the amount of really definite data and experience, other than that associated with established systems, is somewhat scarce. Recent work on carbonization in vertical retorts and in chambers dealing with larger charges than ordinary retorts, has done much to upset traditional views; or, as Dr. Bunte lately put it, our ideas, in consequence of that work, of the phenomena of the destructive distillation of coal have been considerably broadened. No one until that work commenced had any very pronounced belief that it was possible to obtain a greater make per ton of coal (of a quality of gas suitable for modern application) than was being realized by the best of the processes of the time. But, as Mr. Charles Hunt remarked in his recent Presidential Address to the Institution of Gas Engineers—almost echoing the synchronous words of Dr. Bunte—the experience of to-day indicates the existence of a further reserve to be drawn upon for the production of low-grade gas by the application of suitable methods of manufacture.

It is not for us to suggest the lines of research to the Sub-Committee appointed by the Institution. But to-day it is impossible for such an inquiry as they have undertaken to stop at what were until recently the orthodox carbonization practices in the gas industry; and therefore the broad reference to them must involve an inquiry that will occupy considerable time, if their work is to be really comprehensive and thorough. That it can possibly be even reasonably final for a long time to come, no one will dare to submit at the present day without being written down as one who is incapable of seeing beyond his nose. Both the horizontal and the inclined systems of working are not what they were; but, even so, vertical retorts and carbonization in bulk have come, and are boldly challenging the older systems for supremacy of result, when all points from labour to product in gas and residuals are taken into the reckoning. The vertical retort, it is claimed by those who are enrolling themselves as its adherents, offers the merits of more natural construction and operation, and promises to afford, as compared with working predecessors, a larger yield of gas and ammonia, better coke and tar, and gas freer from naphthalene. While for carbonizing in bulk in chambers of greater dimensions than the largest known sizes of ordinary retorts—not passing in one jump from the comparatively small-charge method of to-day to the practice of the bye-product coke-oven adapted to the needs of the gas manufacturer, but stopping at some "half-"way house" with horizontal, inclined, or vertical chambers—the claim is not that the production results will rank much, if any, higher in excellence than they are in present systems, but that there will be a saving in labour, and an improved coke. Modern mechanical methods in the retort-house have left very little waste ground for such systems to reclaim if that is the full scope of the advantage to be derived by the use of these larger chambers. But such chambers have not as yet had the opportunity vouchsafed to them that has been accorded to vertical retorts, which are making considerable progress on the Continent, despite the doubts that exist in many minds as to their ultimate deportment in operation.

With regard to the large chamber working, it will be remembered that the late Herr Merz, of Cassel, tried a setting that was intermediate between a chamber oven and a retort; and it was only a few months ago that Herr Eisele was telling us the setting was still in operation. The yield of gas, however, per ton of coal used and per square foot of ground-space, was smaller than with ordinary retorts; but the coke obtained was better, harder, and denser. Again, at the Munich Gas-Works, large inclined chambers have been under trial for some twelve months. They measure 13·1 feet by 5·9 feet by 1·64 feet. In a recent continuous run of ten days, the average production of gas—Herr Ries, the Manager, informs his professional colleagues—was 10,733 cubic feet, of only 10·8-candle power, but of 662 B.Th.U. gross (596 B.Th.U. net). The coke was of good size with little breeze. Data as to this and the other residuals are available in our columns (June 18, p. 810). The chief advantage claimed at Munich is economy of labour, as compared with any system of continuous carbonization; the economy arising from the chamber being charged only once in 24 hours. The coal used in this working was of German origin; and, of course, much in the way of result depends on the characteristics of the coal carbonized and the temperatures employed. But, on the face of it, the working is not superior to what is customary, and certainly does not give such promise as the vertical system. Clearly, we have not yet got to the end of the trials with these chambers; and we look for knowledge being supplemented by them.

There has now been a mass of particulars published regarding vertical retorts; but the working statistics and the general information are not so comprehensive as are requisite for framing anything like a final verdict, or for any decided favourable view as to supremacy in result as between continuous working and intermittent charging and discharging—other than that with the former there is complete freedom in the retort-house from the disagreeable accompaniments of intermittent operation. Continuous operation, too, is, jointly with high result, the goal of all fresh workers in this field. But as to product results, there is not yet much to choose between the two—continuous and intermittent systems of working. In the first editorial in the "JOURNAL" on June 18, reference was made to Herr E. Körting's working at the Oberspree station in Berlin; and it will be seen that (with his 5-metre retorts, and working intermittently, he is getting much the same gas results per ton of coal carbonized, with much the same calorific power, as Messrs. Woodall and Duckham are doing at Bournemouth, where they are running continuously ("JOURNAL," June 4). But the question of the quality of coal vitiates comparison. This is seen also with regard to the production of gas per retort per day. Some few months back, we had Dr. Bueb reporting a yield of from 10,600 to 14,100 cubic feet per day per 4-metre length of retort; while Herr Körting puts his average with 5-metre retorts at 14,800 cubic feet, which (if Dessau was using the same coal when getting their maximum yield per retort) would not be such good working as Dessau's maximum per metre of retort, though per ton Oberspree and Bournemouth (with their averages of 13,000 cubic feet) come out far superior to Dessau, with its make of from 10,765 to 11,840 cubic feet per ton. But there are for comparative purposes so many disturbing factors in all these published figures, that they must, to be of real value, be amplified with information, and reduced to something like order, by those who alone can give the particulars from their inner knowledge. Again, we get the calorific power of the gas at Oberspree stated at 550 B.Th.U.; at Bournemouth, as 546 B.Th.U.; at Cologne (where there is now the largest vertical retort system in existence), as 500 to 562 B.Th.U.; and at Dessau as 573 to 607 B.Th.U. We take it these are all gross values; but it would be of advantage if "gross" or "net" was always mentioned, in order to avoid misconception and misstatement. However, the figures are interesting in their closeness between Oberspree and Bournemouth and in the wide variations exhibited by Cologne and Dessau (with the same length of retort), and by the inclined chamber working at Munich, as previously mentioned.

Inquiry into this question of carbonization, too, cannot be

complete, without taking into account the examination made of the principles affecting modern working by the late Mr. W. Young, by Mr. W. R. Herring, Mr. Thomas Glover, Herr Körting, Dr. Bueb, and others. It will be found that the problems facing the Institution Committee comprehend physical, chemical, practical, financial (capital, maintenance, and working expenditure), and commercial considerations. The task is big; the ground upon which to work rough and, as has been indicated, bestrewn with difficulty; and the result (owing to unstable and transitory experimental conditions), for some time to come, may not give full satisfaction. But it may give interim direction. If that be so, it will be something gained.

Electrolysis—A Success in the House of Commons.

The Electrolysis Commission of the German Association of Gas and Water Engineers have now been prosecuting their inquiries since 1897; and their latter reports are significant of a deeper conviction than was evident in the earlier ones as to the tortious action of stray currents from electrical systems upon gas and water pipes. In the early days of their inquiry, it did not appear that any great harm was being done by wandering electric currents; then it was found that experiences differed somewhat between towns; and in time evidence was discovered of the insidious nature of electrolytic action, in its slow but sure deteriorating influence upon the substance and strength of pipes. The report which we publish to-day contains further testimony, and points to a serious condition of things, which has a close relationship with the question of public safety. The observations delineated in the report disclose phenomena which will not fail to be attractive to students of this subject and to owners of subterranean pipes. For instance, the Commission were informed three years ago that at Solingen nothing was known of the corrosion of gas and water pipes; eighteen months ago some of the tramlines had to be renewed, and destruction of mains in the subsoil became evident; now it is found that the stray currents have done harm over a large district—even to a distance of 2½ miles. That is the development of the story of destruction at Solingen. At Cassel, a peculiar condition of things was also observed. There an extensive tram service exists; and though the Managers at the gas-works were not aware of any destruction of their pipes, it was found that several mains crossing the rails in the immediate neighbourhood of one of the taking-off points were corroded. One main in particular was very severely injured; being completely eaten away in a certain spot to such an extent that gas escaped violently from it directly the clay soil round it was loosened. This is a fortunately discovered injury, that might have been the seat of untold mischief in Cassel. But what about injury of this kind that is not discovered, and may not be until there is some fell happening? The Cassel and Solingen experiences are proof that the fact of electrolytic damage not having come to light is no guarantee that it does not exist. Again at Karlsruhe, the state of the gas and water mains has become intolerable; and at Strasburg the Commission have gleaned some interesting information as to injury.

The merciless and esoteric workings of these stray currents which the careful labour of the Electrolysis Commission of the German Association has disclosed, have aroused the interest—and very properly—of the local authorities in Germany; and they have evinced a lively and helping interest in the investigations, and have, in fact, invited inspection and advice. Moreover, the electrical and tram associations fully realize the gravity of the matter; and instead of, as in this country, doing all possible to burke investigation, there has been a joining of forces to prosecute research. A Joint Commission has now been instituted to carry forward the work so far well and voluntarily done, and unassisted, by the Gas and Water Association—the constitution of the Joint Commission being four members of the Gas and Water Association, two members of the Association of Industrial Electricians, and two members of the Association of Tram and Light Railway Proprietors. Would such a coalition be possible in this country, where every inch of the way towards protection against injury to underground pipes devoted to the public service has to be fought for?

The Metropolitan Water Board have been one of the persistent fighters in this matter; and they have lately scored a victory in connection with the North Metropolitan Electric Supply Company's Bill, before Sir J. Leese's Committee in the House of Commons. The clause that has been inserted provides (to put it very briefly) that, if it be proved that any injury or damage is occasioned to the pipes, or other underground structures of the Board, by fusion or electric current generated or used by the Company, then nothing in the Act is to relieve the latter from liability to make compensation for any such injury or damage that would have existed but for the passing of the Act. In the discussion before the Committee, the Water Board were greatly assisted by Mr. C. H. Wordingham; and there were several points in his evidence well worth storing in memory. He controverted the statement put forward on behalf of the promoters, that it is impossible for alternating currents to produce electrolysis. He indicated sub-stations as likely places of leakage; and in the event of there being such leakages, he asserted that they would concentrate themselves near the generating-stations, and so might do considerable damage to the pipes in those localities. It was also submitted by Mr. Wordingham that "safety devices are of the most unreliable things in electrical "apparatus. One cannot be sure that they will always act. "They are intentionally made to allow a certain interval of "time to elapse, and a hole might be burnt in cast-iron pipe "in a quarter of a minute or less." The truth about such things is fearfully unpalatable to some British electricians. One of the features of the proceedings, too, was the production of a section of telephone pipe which had been pierced by electrolytic action since the electrification of the tramways in South London. The evidence submitted convinced the Committee that the Company ought not, through the omission of a protecting clause, to be relieved, in the event of injury, from the liability to make compensation which exists under the common law. How can the presence of such a clause in the Bill be a source of any injury or anxiety to the Company, when they submit that the Board of Trade regulations produce the perfect electricity distribution system? Why, it must be a waste of time, money, and energy to contest the matter under such circumstances.

The Commons, the People, and Municipalization.

Things are as they were in connection with the question of the electricity supply of London. The sacred "municipal "principle" has again scored in Parliament; and it is fitting to ask whether the House of Commons now represents the people or purely political dogma. The people of London in November and March last expressed, with unmistakable voice, their desire that the rash schemes of trading entered upon, and proposed to be entered upon, by the then Progressive-Socialist majorities in the local government of the Metropolis should forthwith cease, and to ensure this a fairly clean sweep was made of the gentry of the combination whose rule had been so subversive of the best interests of London. Following the decided mandate of the constituencies, the reformed London County Council altered that product of unbalanced intelligence—their Electricity Bill—which proposed to involve the ratepayers in a multi-millioned and speculative scheme of supply, in such manner that the risks would have been transferred from the ratepayers to private enterprise, while a large measure of control would have been vested in the Council, together with an optional reversion of the powers after a period. This action placed the majority of the House of Commons, which majority are for the greater part disciples of municipalization, in a quandary. Here they had on the one hand the mandate of the people of London, and on the other that sacred principle which, whatever befell, they had pledged themselves to uphold. That the Bill as transformed by the Moderates was more acceptable than the vainly extravagant original was manifested by the rapid secessions from active hostility on the part of Metropolitan interests. The Bill was referred to a Hybrid Committee; and without hearing the opposition, that Committee have declared the preamble of the amended Bill—it is said to be almost unanimously—not proved. In the interests of a mere political tenet, the well-instructed majority of the Committee preferred to ignore the voice of the electors of London rather than brave party ignominy by letting the Bill go forward; and all the time and money spent in parliamentary inquiry into this subject in the last few years have been so much time and money wasted.

The Radical Press are loud in their acclamation of the Committee. The decision was, of course, "expected" by them; for such a "flagrant betrayal of the municipal in-"terests"—mark you "municipal interests," not "public "interests"—could not be tolerated. It was not long since that, in the view of these same Radical papers, London industries were actually gasping—we failed to trace even the

symptoms—for electricity for power purposes; but they now accept it as preferable that London should continue to gasp until there is available the municipal brand of electricity, produced at the risk of the ratepayers, and callously acknowledged by the Progressives to, with certainty (if a scheme is passed by Parliament), commit the ratepayers to direct financial burden during at any rate early years. But as to this, the reasoning of fanatics is ever incoherent; and the reasoning is dictated by the circumstances of the time. The "Daily News," on the decision of the Committee, inflates itself prodigiously, and loftily avows that "no consideration must "lead us to consent to placing the Metropolis under the heel "of another crushing monopoly." A "crushing monopoly!" A "monopoly," if such it could be called, of this character, under parliamentary control, would be quite impotent in any attempted crushing manœuvres; and the factor of competition and the option of the people to patronize or otherwise, would also prevent such private enterprise developing into any such ugly monster as these excited municipalistic monopolists conjure up in their distracted imaginations. Private enterprise under control cannot be so oppressive as municipal government with power to tax ratepayers innocent of all participation in the muddling and mismanagement of those whose enthusiasm—carried to the point of febrile speculation—for a cause is out of all proportion to their ability to direct that cause on practical lines to proper issues.

"But what is to be done next?" ask our friends of the "Daily Chronicle," whose petulance in regard to the doings of the Moderates of the County Council has not been a tittle less than that of the "Daily News." We find their answer in the earnest trust that "by next session wiser and "more public-spirited counsels will prevail in the London "County Council, and that a municipal supply Bill, on "sound lines will be introduced." Between their aspiration and the realization stands a compact body of ratepayers who are not minded to be involved in large responsibilities to provide for manufacturers that which there is no proof the manufacturers will take in profitable quantity, even after it has been furnished. The County Council cannot without consulting the ratepayers—they are in honour bound not to do so—embark upon any scheme such as will meet with the views of the present Government. What is more likely is (if the life of the present Parliament is sufficiently prolonged) that the Government will relieve the County Council from further action by promoting a Public Bill for the creation of a Metropolitan Electricity Supply Board on the lines of the Water Board, and so force upon London what the ratepayers do not require. If this surmise is correct, then the decision of the Hybrid Committee last week was only a move in the game by which the parliamentary coalition have succeeded in holding the people of London in check while they pave the way to a further monument to communistic ideals and waste. But perhaps, if the supposition here expressed has real existence, before the Commons can do anything, the present dominant party will have again been placed in a minority. There is complaint by the existing majority of the actions of the House of Lords; the people of London have a right to complain of the action of the majority of the House of Commons. If the voice of the people is so much revered by the House of Commons, then there ought to be no forced imposition of an electricity scheme upon the ratepayers of London.

Where Ignorance is Bliss.

"Meteor" of the "Electrical Times" presents his readers with some loose remarks on the address of Mr. Charles Hunt to the Institution of Gas Engineers. The electrical people do not like comparisons of the cost per mile between incandescent gas lighting and electricity for street purposes. They regard it as a "ridiculous comparison," and a very inconvenient one. It is submitted by "Meteor" that Mr. Hunt, as President of the Institution of Gas Engineers and a member of the Institution of Civil Engineers, "is not entitled to plead obsolete or superficial knowledge when making a ridiculous comparison." Mr. Hunt is not likely to so plead, nor to admit that his comparison has any other than a sane and practical character. It is the old tale. "Meteor" is following the footsteps of all electricians in taking refuge behind the infinitesimal, which refuses to hide the abnormal character of public lighting accounts since electric lamps have been put up in a few central streets of towns. He says Mr. Hunt probably knows that arc lighting at Hastings does not, "candle power for candle power, cost anything like ten times as much as incandescent gas." Mr. Hunt was not talking of "candle power for candle power," but of the waste of ratepayers' money involved, in this case, in spending ten times more per mile on lighting by the electric system, while improvement can always be effected at smaller outlay by the incandescent gas system. We venture to assert that no town has received compensatory benefit for the large additional expenditure per mile on electric lighting. "Meteor" also asks whether Mr. Hunt seriously suggests that the promenades and show streets in health resorts should be lighted by gas? To save "Meteor" a shock, if Mr. Hunt troubles to reply to him, we warn him that that reply may be summed up in the single word "Certainly." We cannot think that "Meteor" has been to the Dublin Exhibition; if he had, he could not have honestly written: "The Dublin Exhibition has disgusted thousands of people with its tawdry array of gas mantles." "Meteor," too, presumes that Mr. Hunt's reference to "the idea of cheap fuel gas" taking "firm hold of the public mind," means that the public mind has absolved gas from all further responsibility in the provision of a perfect illuminant. If our journalistic contemporary will give a little thought to the bunsen burner, the calorific power of gas, and the needlessness of illuminating power when gas is used in the bunsen burner, the idea may take a firm hold of his mind that, when the gas industry is further released from grandmotherly legislation, a "cheap fuel gas" will be found to do all that is required for the gas industry to maintain and further its position as an economical illuminating agent. There is behind Mr. Hunt's words a reserve for progress by the gas industry in the provision of economy for the public.

The London County Council and Public Lighting Costs.

The London County Council are following in the wake of the Local Government Board, and are inquiring of the Battersea Borough Council whether they "have considered the relative cost of lighting the streets with gas and electricity?" This pertinent inquiry the Local Government Board have for some time past been putting to local authorities; and though the local authorities do not publish their answers, the pointed question is undoubtedly having a salutary effect, and is saving the ratepayers a considerable additional amount of useless expenditure. The question to the Battersea Borough Council was provoked by a most intemperate scheme that they have been countenancing for lighting by electricity the roads on the Park Town Estate, and for which they made application to the County Council for sanction to borrow £2270. Having regard to the "heavy cost of installing electric light," and to the fact that little if any use would be made of the mains for private supplies, the Finance Committee of the County Council have informed the Borough Council that they do not view the application for the loan with favour. We will give the old County Council their due by saying that they, too, were favourable to gas for public lighting, as the bridges across the Thames bear witness.

Some More Corporation Results.

In the present number of the "JOURNAL" there will be found notices of the annual reports as to the working of several more of the municipally owned gas undertakings; and these, like the earlier ones, are of a generally satisfactory character. The first mention may be given to the Edinburgh accounts—which, however, are dealt with fully by our "Scotch Correspondent" this week. Here, it will be seen, the total revenue, at £325,222, is £17,647 more than that of the preceding year; while the expenditure has increased by only £6875. The quantity of gas sold—roughly 1931 million cubic feet—was about 86 million cubic feet above the figure for the preceding twelve months. The gross profit at Oldham is somewhat less than was the case the previous year; but this is merely due to a reduction in the charge made to consumers. In fact, during the past twelve months the average price realized for gas sold (including gratuitous lights—*i.e.*, the street-lamps and municipal buildings), fell for the first time below 2s.—the exact figure being 23·67d. The increase in the quantity of gas manufactured was just over 7 per cent.; while the loss by leakage (5·69 per cent.) showed a slight reduction. The amount by which the borough fund will benefit is £8515. From the profits at Nottingham, a sum of £27,000 is to be handed

over in relief of the rates; and this will leave a balance of £23,303 to be disposed of on depreciation, repairs of works and plant, &c. There was a slight increase in the gas sold. At Smethwick, £2000 is to be allocated in relief of the general district rate, and £1000 is to be contributed to the cost of the new Council House. In addition to this, £5961 is to be carried to the depreciation and suspense fund account. The output shows an increase of 5·65 per cent., which is the more satisfactory as it follows upon an increase of nearly 13 per cent. in the preceding year. The total income is £2508 more than last year, in spite of the fact that a reduction in price to small consumers absorbed over £500. The results at Coventry have been such as to permit the Committee to recommend that a sum of £2000 should be paid over to the district fund. This will leave a balance of £1492 to be carried forward. Sales of gas at Skipton show an increase of 7 per cent.; while the loss from leakage has been reduced to 3·2 per cent. The profit is slightly less; but here, again, the consumers have benefited by a reduction in the price of gas. The outstanding feature at Stafford is the unaccounted-for gas, which is only 2·06 per cent. of that sent out.

Workmen's Compensation Insurance.

The question of the new Workmen's Compensation Act was brought before the annual conference of the Institute of Municipal Treasurers and Accountants by Mr. T. Sumner, the Borough Treasurer of Birkenhead, who said that trouble from it was only what might be expected. He drew attention to the circular recently issued to local authorities by the Local Government Board (as noticed in the "JOURNAL" at the time), which stated that it appeared to the Board that these bodies generally would be employers within the meaning of the Act, and that to the extent to which, in this capacity, they would become subject to liability which might be met by insurance, they might properly incur reasonable expenditure in effecting an insurance against their liability under the Act. This led the author to the real subject of his paper, which was the question of the best mode of meeting the liability. The prices quoted by various Insurance Companies made it evident to him that a gigantic "ring" had been formed, which did away with competition for business which was of a very remunerative character owing to the excessive rates that had been fixed. Mr. Sumner said that, so far as he was aware, there was no legal reason why a local authority should not protect themselves in regard to their liability by paying into a reserve fund a sum equivalent to the amount that would be paid to an outside company for covering the risk; or, as an alternative, they might accept the responsibility of being their own insurers up to a given figure—say, £700 or £1000—in any one year, and then take a cover from an outside company for the excess, in which case the premium would be materially reduced—to perhaps 2s. 6d. per cent. all round. Members who took part in the subsequent discussion approved of the idea of local authorities undertaking their own risks. At Birmingham, it seems, a determination has been arrived at to take the liability themselves for a year at any rate. Among other Corporations who have decided to run their own risks in the matter were mentioned Bristol and Nottingham. One gentleman, however, said that he found the Insurance Companies were treating Corporations upon their merits, for the simple reason that the risk in every case was not the same. No doubt in the course of a year or so employers of all kinds will be able to see a little more clearly than they do now to what extent the new Act will penalize them; but for the present there must be a considerable amount of uncertainty.

Mr. W. Thomson, the newly-appointed Manager of the Ramsgate Gas and Water Works, was presented with a handsome walking-stick, with a silver mount suitably engraved, as a parting gift from employees at the Kendal Gas and Water Works.

The recent death is announced of Herr Ludwig von Stephani, the founder and for many years the Manager of the General Austro-Hungarian Gas Company at Buda-Pesth. He was born at Mannheim, and was for 51 years at the head of the large undertaking in Buda-Pesth.

At the close of the report in last Tuesday's "JOURNAL" of the remarks made on the resolution in regard to the International Photometric Committee submitted at the meeting of the Institution of Gas Engineers, it was stated that the resolution, as amended by the substitution of the words "up to and including 20 candles" for "under 20 candles," was carried unanimously. It has since been pointed out that there was one dissentient—Mr. Walter Grafton.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 57.)

THE change—long hoped for, long deferred—has come at last over the wretched state of things on the Stock Exchange. It wanted only a spark to light up the gloom, in the shape of a word from the right quarter; and last week it came. It is remarkable that the depression could have been so heavy and so persistent, while general conditions pointed in the other direction. Misgivings and apprehension, though vague, were potent, and that shy bird, confidence, was badly scared. Now the Chancellor has spoken out and allayed the uneasiness; but it is a pity he did not do so earlier. The week opened in a way prepared for better things. Affairs abroad seemed less alarming, and a generally more cheerful tone was evident. When later on it was known that the Transvaal Loan was postponed, and that there would be no new home issues, a quick recovery set in. Consols rose ¾; and other departments moved sympathetically, though business was not booming. And so onward from day to day the tone continued to improve and prices rose, though checked now and then by the inevitable realization to secure profits. Consols (which had been done at 83⅝ a few days previously) touched 84 1/16. In the Money Market, there was a very strong demand (it being account week, and the close of the half year), and a large business was done at higher rates. But discount rates pointed to increased ease in the immediate future, and steadily declined. Business in the Gas Market showed a falling off in volume, especially the earlier portion of the week. Changes in quotation were largely due only to *ex div.* adjustments. Actual variations were not numerous, and they were irregular—gains and losses being about on a balance. In Gaslight and Coke issues, the ordinary was in good favour, and added to its increase of the week before. On Tuesday, 92½ was the figure. Thenceforward the price rose steadily, however, and 94 was repeatedly marked. The secured issues were very inactive. Nothing was done in the maximum or the preference; but the former gained a point. The debenture changed hands at from 82¾ to 83½. There were an unusual number of transactions in South Metropolitan. On Monday, it was done at 119½ (a fall of 1 in the quotation), and fell another point on Thursday, with business done at 117, but recovered 1 later on and touched 119. The debenture marked from 83¼ to 83¾. Commercials were very quiet. The 4 per cent. was done at 107¼ and 106½. Among the Suburban and Provincial Companies, Alliance old marked 20 and 20¼, Brentford old 249 (a rise of 2), ditto new 190, Brighton original 220, British 41 special, Tottenham "B" 100¼, Wandsworth "B" from 133 to 130, and West Ham 104. In the Continental group, Imperial was 1 higher, with business at from 170¾ to 172. Union was not dealt in; and European fully-paid marked 23¼ special. Of the undertakings of the remoter world, Bombay changed hands at 6⅝, Buenos Ayres at from 11⅛ to 11⅜, Primitiva at 7, ditto preference at 5 1/16, ditto debenture at 94, River Plate at from 12⅞ to 13⅛, ditto debenture at 95, San Paulo at from 12⅝ to 12 13/16, Cape Town debentures at 50¼, and ditto debenture at 95¼.

ELECTRIC LIGHTING MEMORANDA.

The London County Council Bill—Preamble "Not Proved"—Justice or Partisanship—A Review of the Council's Proposals—Competition and the Necessity for Diversified Loads—Some Points to be Remembered—Edison's Prophecies.

THE London County Council have not succeeded with their Electricity Supply Bill; and we do not think the majority of the members will be much perturbed over the matter. The strange thing, however, is that the Hybrid Committee, to whom the House of Commons had referred the measure rejected it last Wednesday morning without hearing the opponents' cases. This fact appears to indicate that it was not upon the merits of the scheme as modified by the Council, but upon the abandonment by the Council of the principle of direct control and management, and the proposed transference of powers to private enterprise, that the Committee founded their determination. It was true that the Committee conferred in private before delivering their decision; but the fact that they did so is not proof of anything in particular—not even of a farce, a blind, or a serious discussion of the *pros* and *cons* of the case. Anyway, the decision came as a great surprise not only to the promoters but to the opponents. The matter is referred to in our editorial columns, and so need not be further discussed here.

However, between the rejection of the Bill and the last opportunity we had of alluding to the proceedings before the Hybrid Committee, a mass of instructive evidence was given, from which (to complete our review of the chequered career of the Bill) a few points may be drawn. The mandatory instruction of the House to the Committee obliged the County Council to insert the conditions in the Bill which it was proposed should be observed by the Council and the transferees. If no transfer or assignment of the powers granted were made within a year from the passing of the Act, then the powers it was suggested should lapse; and such an event the County Council thought might be regarded by

them as a warning against their taking up the supply. Had the Bill gone through, any transfer or assignment it was intended should be by deed, approved by the Board of Trade. The transferees, too, were to be confined to the sites at Barking and Erith (the latter was afterwards dropped); the generating-stations were to be constructed and equipped in accordance with designs and specifications incorporated in the deed; electrical energy was to be supplied within the time specified in the Act; the maximum prices to be charged for electricity were not to exceed those specified in the Act, or for the time being in force under any revision, which revision was to take place at the end of ten years, and at the end of every subsequent seven years; the amount of the dividend was to be regulated by the prices charged; and (this was the objectionable clause to which we have previously given consideration) a proportion of the surplus profits beyond the standard dividend was to be paid to the Council, and be applied for the benefit of the ratepayers in the area of supply. The primary object of the scheme was a cheap supply of electrical energy; and this condition would, in our opinion, have assisted in baulking the attainment of the cheapest supply.

The proposals as to price were based upon the principle that the consumer should pay a fixed sum per annum per kilowatt in respect of the standing charges, with a special low price per unit of electricity used—this being regarded as the fairest method of apportioning the standing charges incurred in meeting a consumer's possible maximum demand, and in this way the higher a consumer's use of electricity, the cheaper per unit his electricity would become. Thus the scheduled terms of supply were as follows: To authorized distributors: High pressure, £3 15s. per kilowatt per annum, *plus* 0·22d. per unit; transformed alternating, £4 7s. 6d., *plus* 0·25d. per unit; low-pressure direct, £5 12s. 6d., *plus* 0·27d. per unit. To power users: Transformed alternating, £5 5s., *plus* 0·3d. per unit; low-pressure direct, £6 15s., *plus* 0·33d. per unit. These are the prices; but their profitableness would, of course, depend on a phenomenal condition of business development. The County Council have their own generating plants for tramway purposes. Railway companies who may convert their systems to electrical traction would prefer to have their own plants rather than put their trust in an extraneous source of supply over which they had no control. The electrical dreamers thought otherwise, and were also contemplating that the power users of London were going to forsake all other means of obtaining power, and glide with the minimum of resistance into the electrical net. The existing electricity undertakings of London do not share such optimism; and the Moderates of the County Council, and the ratepayers whose mandate they were observing, could not see things in the same glowing light as the aforesaid electrical dreamers, or there would have been no question of the transferring of powers. It is computed that there are at the present time in industrial establishments in London 370,000-horse power in use—steam, gas, hydraulic power, &c.; and this would provide a sufficient demand to utilize 180,000 kilowatts. No doubt this is so, if the users of the power would all consent, for the benefit of such an electricity undertaking, to scrap their plant, and use electrical driving in its stead. But would they all do this? The answer is a pretty sure one, notwithstanding a provision of £150,000 being made in the estimates to facilitate the hire-purchase of electric motors. The first generating-station to be put up, it was proposed, should be at Barking. This Barking station, it was intended, should have a capacity of 120,000 kilowatts, and an overload capacity of 180,000 kilowatts. Therefore, with the tramway supply provided for, the railway companies having a preference for their own supply, and the existing Borough Council and Company suppliers preferring to make their own plants more lucrative by developing them as opportunity served, and the power users not being of one mind as to the advantages of electrical driving, the profitable prospect for the first section of the Barking station did not look as though it would be a bright one for at any rate many years to come. During the proceedings before the Committee, the now stale evidence as to large units, water carriage, availability of water for condensing purposes, and so forth being essential for cheap production was shaken out with care before the Committee. But what is really essential for cheap production is the business to keep large units of plant going.

There is another point. Competition in electricity supply in London exists in Bermondsey, in parts of Camberwell, Chelsea, Finsbury, Greenwich, Lambeth, and Southwark, and in the Cities of London and Westminster. Now, the scheme embodied in the Bill was going to commit the whole electricity supply of London to competition; and competition in such supplies as gas and electricity can have (history shows) but one effect. The scheme did not intend to compete for lighting, except in so far as up to 20 per cent. of the current used in industrial establishments might be employed for lighting purposes. But applying to our reasoning the statements of Mr. J. H. Rider, the Council's Electrical Engineer, the scheme would have worked mischief among the existing undertakings by depriving them of something necessary to their well-being and best service. The argument is crystallized in one of Mr. Rider's precepts: "In order to obtain a large load-factor, the load dealt with by a station must be of a diversified character." The scheme contemplated the depriving of the existing undertakings of that day and summer demand which contributes diversity to their load; and, therefore, the lighting consumer was to be made to suffer for the power consumer.

But leaving aside that point, there were other statements in Mr. Rider's evidence which we may place among our *memorabilia*. Here are examples: "For electric heating a cheap supply would be popular. At present, it does not pay to adopt electric heating at existing lighting rates; and even power rates are none too low to ensure a rapid increase in the demand." He also thinks that, to some extent, "current is now supplied for power at the cost of those who take it for lighting." Again, "in many cases the authorized distributors have treated the power load as a sort of bye-product, and have been able to charge low rates because they have kept up the price for private and street lighting; whereas in my view all should be charged on a common basis—that is to say, each kind of supply should be charged in accordance with its proportion of standing charges and running costs." These are points well worth remembering.

Mr. Edison has been a great inventor, and he has been great at prophesying; but his predictions have not always come off, though to tell the truth some years ago they somewhat upset the nerves of numerous shareholders in gas undertakings. If there are any such nervous shareholders now, and they believe in Mr. Edison as a prophet, they had better take steps to clear out their holdings. They will find a free market for them. Not only gas shareholders, but proprietors in all industrial businesses turning out mechanical appliances that are not worked electrically, are warned—by Mr. Edison. It is a little too soon, however, to think of converting those businesses into electrical ones, as the makers of electrical plant are already rudely jostling each other to such an extent that they are not having a very comfortable time of it. However, if the proprietors in the businesses that are not of the elect believe in Mr. Edison, and they turn to the production of electrical machinery for the good time that is said to be coming, they must blame him if this does not turn out as they would desire. Mr. Edison is now 61 years of age; but he admits that he knows now very little more about electricity than he did at the start. Nevertheless, he expects to see at an early date the direct generation of electricity from coal by a cheap process. Then the electrical industry will be in its heyday, and many other industries will sink into oblivion. Locomotives will be thrown on to the scrap-heap, which will be a very big one. All trains will be run by electricity. A large portion of the goods traffic of the railways will be taken from them, much labour will be dispensed with, and the workhouses will be filled (for no longer will coal be laboriously transported to our cities). Great power plants will be established at the pit's mouth, from which electricity will be sent all over the country by wire. There will be no horses in the streets, no stables required, no "flies" (the wheeled variety) needed, waggons will be propelled by electricity, ships will no longer be driven by steam, and houses (oh, terrible thought!) will be lighted entirely by electricity, for it will be so cheap that it will be used even by the humblest tenement dweller. Hence there will be more than locomotives and cabs for the scrap-heap. Extensions of gas plant had now better be stopped, and further research in the gas industry need not be entered upon—for the Prophet Edison has spoken.

Transferred Members of the Institution.

At the annual meeting of the Institution of Gas Engineers it is customary to announce the names of those who have been transferred by the Council during the preceding twelve months from one class of membership to another. This was not done at the recent meeting; but we have since received from the Secretary (Mr. Walter T. Dunn) the following names of associate members transferred to the class of member:—

Gibson, R. E.	Liverpool.
Goodenough, F. W.	Westminster.
Greenaway, Reginald	Bodmin.
Hulme, Charles	Uxbridge.
Morton, Philip	Genoa.
Nuttall, L. W	Gosport.
Saville, H. W.	Drogheda.
Shadbolt, Samuel	Kirkby-in-Ashfield.

It is reported that a discovery of monazite earth has been made on the Eleanor River, 28 miles west of Kingscote, South Australia. Some people who were prospecting for gold found that the soil contained monazite, which separated from the other constituents of the soil comparatively easily, yielding a paying percentage of thorium oxide.

The Council of the Society of Arts are prepared to award, under the Fothergill Trust, a gold medal or a prize of £20 for the best portable apparatus or appliance to enable men to undertake rescue work in mines or other places where the air is noxious. It is intended that the apparatus sent in shall be submitted to practical trials and tests. In the award of the medal, regard will be had, first of all, to excellence of design and contrivance; and, secondly, to excellence of manufacture. Inventors intending to compete should send in a notice of their intention, together with a full description of their inventions, not later than March 31, 1908, to the Secretary of the Society, John Street, Adelphi, London, W.C.; and in cases in which the apparatus has been put into actual use, the experience of such use should be given, and the special points of merit of the apparatus indicated.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

REVIEW OF THE PROCEEDINGS (Continued from Vol. XCVIII., p. 1003).

On another page is given an abstract translation of Herr Kobbert's paper on "Questions as to the Limitations of Gas Supply, and their Solution." A summary of Dr. Bunte's lecture on the "Combustion Phenomena of the Inverted Gas-Burner" also appears to-day. These are the only remaining communications relating to gas supply of which it appears necessary to give a detailed report. The papers dealing with water subjects, which were read at the meeting on Thursday, June 13, should, however, be briefly noticed before giving a summary of the reports of the several Committees.

Water Supply Topics.

Herr O. Smreker, of Mannheim, gave an exhaustive address, elucidated by maps and diagrams, on the "Hydrological Investigation of Underground Water Areas, with Special Reference to the Vicinity of Mannheim." He began by pointing out that it was no longer thought sufficient to know that the quality of underground water intended for a town supply was at the time unobjectionable; it was rightly considered necessary to prove that it would continue unobjectionable for the future. When he, in 1882, had to consider the question of the supply of Mannheim with water, different opinions prevailed. Owing to the great distance of the hilly country from the town, springs in the proper sense of the term were out of the question as a source; and it became necessary to choose between underground water and the river (Rhine) water. Trial borings were made in the plain of the Rhine and in the Neckar valley; and it was found that on the north of the town there was a strong flow of underground water from the mountains to the Rhine. This water had the requisite degree of hardness, and was otherwise unobjectionable.

The next paper was by Herr Gross, of Stuttgart, on the "Means of Water Supply in Würtemberg." It described how, since 1870, schemes for the supply of water, not only to single towns, but to groups of places, had been adopted, until at the present time there are in Würtemberg 29 works serving groups of places. These works supply 378 communities.

Mr. W. H. Lindley, of Frankfort-on-the-Maine, then delivered an address on the "Discovery of Sources of Supply for the Water Supply of Large Towns on a More Scientific Basis." He described graphically different methods of water supply adopted in a number of towns in the East and elsewhere—as, for instance, Bucharest, Baku, and Tiflis—and the different classes of water used. In Tiflis, the water came out of the rock. Lodz, the large industrial town in Russian Poland, did not stand above any water. The conditions of supplying water were very difficult in that case; but exhaustive geological investigations had proved that there was to the south-west of the town a big band of oolite with extensive springs. Common sense and a proper training in physics and geology would, he said, accomplish much more than human magnetism. The speaker's remarks, which were punctuated with touches of humour, were very well received, and were favourably discussed by a number of water engineers.

Dr. Kolkwitz, Professor at and Member of the Royal Experimental and Testing Institute for Water Supply and Drainage at Berlin, read the next paper, of which the subject was the "Biology of Springs and Wells." He pointed out that, in addition to the animal organisms in water, there were vegetable organisms to be considered. He referred to the different varieties of mould and fungus. There were series of interesting organisms in most shallow wells and old watering-places; but organisms were also to be found in artesian wells.

The Technical Committees' Reports.

Passing from these papers on water supply, it will be convenient next to refer to the reports of the various Technical Committees appointed by the Association, and to take them in the order in which they have been issued, rather than as they were presented as occasion arose at the meeting in the intervals between other business.

The report of the "Committee on Photometry" was presented by its Chairman, Dr. W. Leybold, of Hamburg. A digest of this report was given in the "Journal" for June 18 (p. 812). The Chairman brought forward a motion to the effect that the Committee should be authorized to make an investigation as to whether, and in what way, the rules adopted by the Union of German Electro-Technicians for the photometry of arc lamps could be applied in principle to outdoor gas lighting. The motion and the report of the Committee were adopted; and a sum of 900 marks (nearly £45) was allotted for expenses during the ensuing year.

The report of the "Committee on Heating" was also summarized in the "Journal" for June 18 (p. 812). It was presented by its Chairman, Dr. Schilling, of Munich. The Committee intend to participate, so far as heating by gas is concerned, in the forthcoming Congress on Hygiene and Demography at Berlin. The Committee were allotted 2000 marks (nearly £100) for expenditure in the ensuing year.

The report of the "Committee on Gas-Meters" was presented by the Chairman, Herr C. Kohn, of Frankfort-on-the-Maine. A digest of this valuable report is given on another page of to-day's issue. The Committee were financed to the extent of 600 marks (nearly £30) for the coming year.

The report of the "Committee on Water Statistics" was presented without discussion by Herr Reese, of Dortmund; and a grant of 3800 marks (nearly £190) was made for expenses during the ensuing year. A summary of the report will appear in due course.

The report of the "Committee on Working of Water-Works," which was presented by Dr. Wellmann, of Charlottenburg, gave rise to some discussion as to the collection of statistics on the use of the divining rod. The Committee have now collected a vast amount of information concerning cases in which the divining rod has been applied; and it is proposed to classify this and publish a summary shortly. The Committee were allotted 600 marks (£30) for work next year.

A valuable report was presented on behalf of the "Committee on Earth Currents," by Mr. W. H. Lindley, of Frankfort-on-Maine, who stated that collaboration with the Union of German Electro-Technicians and the Association of German Tramway and Light Railway Offices had proved very satisfactory. He had been elected Chairman of the Joint Committee of the three bodies. A sum of 7000 marks (nearly £350) was placed at the disposal of this Committee for investigations during the coming year. The report in a condensed form will appear in a later issue, and is well worthy of perusal.

The "Committee on Instruction" presented, through Herr Ries, of Munich (in the absence of the Chairman, Dr. W. von Oechelhaeuser, of Dessau), a report, of which a digest is already in type. In some points, it overlaps the important report of the Committee on the Association's Instructional and Experimental Gas-Works, on which a special article is in preparation for the "Journal." This report was presented by Dr. Bunte, who took the opportunity to explain that when discussing the merits of the Munich carbonizing chambers and vertical retorts in the course of the first day's proceedings (see "Journal," Vol. XCVIII., p. 811), he had not intended to indicate that he considered the Munich chambers superior to vertical retorts in themselves, but only to vertical retorts with continuous working such as were being tried in England. The Instruction Committee received a grant of 750 marks (nearly £37 10s.) for the ensuing year; and the Instructional and Experimental Gas-Works 21,500 marks (nearly £1075).

The only other report was that of the "Museum Committee." A sum of 1000 marks (nearly £50) was placed at the disposal of this Committee for use during the coming year.

(To be continued.)

MANCHESTER GAS EXHIBITION.

The arrangements for the Manchester Gas Exhibition, which is to be opened on Oct. 23 next, are now in an advanced state. The Advisory Committee are desirous that it should be generally known, not as a Gas Lighting Exhibition, but as an "Exhibition of Light, Heat, and Power from Gas;" and efforts have been made to secure special exhibits of plant using gas in manufacturing operations—such as gassing frames (using high and low pressure), hatters' machinery, tinmen's stoves, glass blowing, and other interesting processes for which gas can be, and is being, utilized. Promises of assistance have already been received, provided satisfactory arrangements can be made as to power. Negotiations are now in progress to this end; and there is little doubt that they will be successful. The Advisory Committee have also been able to secure the assistance of the Manchester Corporation Gas Committee, who will meet all exhibitors handsomely in the laying of pipes in the hall, and in the charge for gas; the Chairman (Alderman Gibson) having promised a rate lower than, or as low as the present power rate. A large number of street-lamps in Oxford Street and the adjoining streets will be placed at the disposal of the Committee, on which exhibitors can show their latest productions in street lighting lanterns and burners.

The allotment of the stands is in the hands of a Sub-Committee acting with the Manager; and all the best places are now let. The following is a complete list of the firms who have definitely completed their contracts for space with Mr. Cawood, and have had their stands allotted.

Anderson and Duffield
A.V.I.L. Company
Arden Hill and Co.
George Bray and Co.
Bever and Wolff
Cannon Iron Foundries
Carron Company
S. Clark and Co.
Davis Gas-Stove Company
Flexible Metallic Tubing Co.

Fletcher, Russell, and Co.	Planet Foundry Company
Bland and Co.	Pneumatic Gas Lighting Company
Thomas Glover and Co.	A. E. Podmore and Co.
S. Gratrix, Jun., and Bros.	Ramie Company
Hayward and Co.	Richmond Gas-Stove and Meter Company
Imperial Stove Company.	J. Russell and Co.
James Keith and Blackman Co.	J. Stott and Co.
D. D. Macpherson and Co.	Welsbach Company
R. & A. Main	Wholesale Fittings Company
Thomas Marsh	J. E. Williams and Co.
Moores Makinson and Co.	Wilsons and Mathiesons
Parkinson and W. & B. Cowan	John Wright and Co.
New Hygienic Stove Company	

In addition to these, there are eleven firms who have not yet completed their contracts, and whose space has not yet been arranged. These include several gas-engine makers, the special process machinery makers mentioned before, and two important lighting firms. When these are completed, more than five-sixths of all the available space will have been taken.

A Sub-Committee have in hand the lighting and ventilating of the hall; and offers are now received for both, and will be considered shortly. Another Sub-Committee have under their charge the organization of, and arrangements for, lectures and competitions; and they will be assisted in both by a Committee of the gas-stove makers. Arrangements are in hand for popular lectures on the use of gas. There will be special lectures to architects, builders, plumbers, and gas-fitters, and cookery lectures and competitions for school-children.

Circulars are now ready for sending out to manufacturers of gas-works plant, and testing apparatus and scientific instrument makers, stating that a large space has been reserved for models which will be received, staged, exhibited, and explained free of charge to those sending them. As there is not the least doubt that the exhibition will be visited by everyone interested in the manufacture, distribution, and testing of gas and its products within fifty miles of Manchester, it should benefit everyone in the profession.

The Chairman of the Advisory Committee (Mr. Thomas Newbigging, M.Inst.C.E.) or the Hon. Secretary (Mr. H. Kendrick, of Stretford) will be pleased to give all information or answer any query as to the scope and arrangements of the exhibition; and Mr. W. Whatmough, of Heywood, one of the Joint Hon. Secretaries to the Committee, will be glad to do the same with regard to the lectures and lighting, as from now he will take over the duties as Hon. Secretary to these two Sub-Committees.

NOTES FROM WESTMINSTER.

THERE is not much stirring in the Committee Rooms just now; but notes upon a few points are made in the succeeding paragraphs. The consideration by a House of Lords Committee of the Bill of the Hull Corporation for the purchase of the East Hull Gas Company's works is near in hand; and we look for the result before the end of this week, hoping and expecting that the Lords will refuse to endorse an expropriation of property for which there is no reasonable excuse. During last week, the London County Council Electricity Bill met with a premature end, at the hands of the Hybrid Committee of the House of Commons; but in view of the allusion to the matter in the editorial columns and in the "Electric Lighting Memoranda" to-day further reference is omitted in these notes.

Annfield Plain Gas Bill. The Annfield Plain Gas Company's Bill was pursued by the Annfield District Council to the House of Lords. The measure was under the consideration of a Committee last week, with the result that the position of the questions involved (with one exception), and of the Bill itself, remain unchanged. The success of the promoters has been, with the one exception, complete through both Houses; and we are not disposed—in view of the state of the gas supply in the district, and the work that has to be done to put it in a proper condition, to give the best possible service to the people—to in any way question the verdict of the two Houses. But with regard to the exception, the consideration we gave to the Bill at the time it was before the House of Commons was directed by the terms of the measure as originally printed; and our knowledge was short of the one and important point that the promoters had subsequently introduced a clause which would have considerably curbed the arbitrator in determining the sum the Gas Company were to pay to the vendors Messrs. Schultz and Comins for the property and the works executed by them, and which might (we do not say would) have given them more than the fair value of the property—to the detriment of the gas consumers. The liberal terms of the inserted clause were, in fact, such that the vendors had, up to a point, virtually constituted themselves both vendors and arbitrators as to the sum they should receive. That has now been altered; and the direction to the arbitrator is that the purchase price shall be the total of the actual sums paid by Messrs. Schultz and Comins for the lands, gas-works, and property, and the cost and expense of, and incident to, the acquisition thereof, together with the fair value of all works executed by them since they themselves acquired the property. The purchase price is to be determined by a single arbitrator, to be appointed, on the application of either party within three months after the passing of the Act, by the President of the Gas Institution, in accordance with the Lands Clauses Act.

Metropolitan Water Supply. Several Bills affecting water supply have lately finally moved from the Committee stage. There is the Metropolitan Water Board's (Various Powers) Bill, which is a measure of very extensive purpose. Amendments were made in parts and new clauses inserted as the result of the opposition of interested parties. But the main point of the measure, which stands intact, is to confer upon the Board further powers for providing for the safety of the supply to the Metropolis. In an undertaking of such immensity, there must be here and there weak spots; and it has been the business of the Chief Engineer (Mr. W. B. Bryan) to detect these. The Board are in very safe hands. One of the important mains upon which the Board have to rely for an equally important part of their supply is, in its single existence, a source of jeopardy in the event of an accident to it; and the Bill will give power to relieve the Board from sole dependence upon it in respect of the supply it conveys. The Board have also a scheme in hand for the construction of what is to be known as the Island Barn reservoir; but several of the local authorities and landowners in the neighbourhood of the site are not at all friendlily disposed to the reservoir. They therefore opposed the Bill. But self-interest had to give way (as it always must do) to public necessity. After the revision of the Bill, the preamble was declared proved. The Joint Committee of both Houses have also concluded their consideration of the Board's Charges, &c., Bill; and it has been sent forward. The principal proposal of the measure is, it will be remembered, the equalization of charges in the area of supply; and this was agreed to before the long and critical examination of clauses was entered upon. At the time a little comment was made in these "Notes" on this feature of the measure.

Repayment of Water-Works Capital. In the case of water-works of considerable magnitude, which occupy some years in construction, there must be, on the part of Parliament, a benevolent latitude in the matter of the period from which repayment of capital must commence, seeing that the large sums required are borrowed at various periods as the works proceed and are long in becoming remunerative. Birmingham has nothing to complain about regarding the considerate treatment that Parliament has meted out to them in connection with the large water-works which they obtained power to build in 1892. But at the same time, we cannot in 1907 understand why fifteen years have been allowed to elapse before the Corporation have secured the sanction of Parliament to such a reasonable matter. The money authorized in 1892 amounted to £660,000; and the period of repayment was named as 60 years, with a suspension of the sinking fund for ten years—that is to say, to the end of March, 1903. In 1902 the sinking fund was further postponed for six years. But some of the money has been borrowed as recently as last year. Now the Corporation are asking Parliament to spread the payments to the sinking fund according to the dates of the loans—in other words, to date the sixteen years' suspension from the time each debt was originally incurred. Parliament has seen no difficulty in acceding to the request; and so the Bill goes forward, and the Corporation and ratepayers will be happier than before. This question of repayment also came forward in connection with the Tees Valley Water Board Bill, referred to in a subsequent paragraph.

Protecting a Railway Company. There was only one opponent when the Southport, Birkdale, and West Lancashire Water Board's Bill was called before the House of Commons Committee presided over by Sir Joseph Leese. The Lancashire and Yorkshire Railway Company were desirous that the Board should obtain their consent before water-mains were laid under their property. But the Board, on their part, would not voluntarily assent to this. The Railway Company, however, did not take up any dog-in-the-manger attitude, but were willing that any difference should go to arbitration. Thus it came to pass that it was agreed that, in the event of difference, the matter should be submitted to an arbitrator appointed by the President of the Institution of Civil Engineers.

Tees Valley Bill. The Tees Valley Water Board Bill has not had to meet any serious hostility in the House of Commons; the brunt of the opposition the Bill originally provoked having been met in the House of Lords. There were only two manufacturers in opposition on the question of the proposed increase in the charges for trade supply from 3d. to 4¾d.—an increase that most of the ironmasters agreed to pay. The ratepayers on Teeside have of late years had a fairly heavy burden to bear in connection with their water supply; and this relief will be welcome. Another point secured is that the sinking fund on the expenditure for the Grassholm reservoir has been suspended until 1914. Although this is opposed to the recent practice of the Local Government Board—viz., to compel the payment of interest and redemption from the period of new works being started—it seems only fair that redemption should date from the time, and not before, the works become operative.

Water from the Bure. The Great Yarmouth Water Works and Lowestoft Water and Gas Bill, which incorporates the powers for a joint scheme for taking water from the River Bure, is again being opposed by the Yarmouth Corporation in the Commons; but the proceedings before the Committee

have not yet been completed. The whole question was thoroughly well discussed in the Lords; and the evidence that is now being tendered lacks one thing, and that is freshness. As a matter of fact, it is difficult to see what can be said upon the matter that can be honestly described as new.

THE LIMITING CONDITIONS WITH GAS-WORKS.

THE following is a summary of the points dealt with by Herr Kobbert, of Königsburg, in his rather long and speculative paper, at the recent meeting of the German Association of Gas and Water Engineers, dealing with the conditions which limit the extension of the supply from gas-works.

He began by pointing out that there still remained a very wide field over which the operations of gas undertakings could be extended. This was especially the case if gas-works were regarded as central stations for the supply of heat; and he proposed to discuss their limitations from this aspect. As to their limitation for the supply of light, it was wrong to assume that there was any limit. The question was not one of gas *v.* electricity, for electricity was merely a secondary—frequently only a tertiary—form of energy, while gas was a primary form. Gas lighting was still only in course of development; and it must be conceded that gas would be capable of fulfilling, either directly or indirectly, every requirement in regard to lighting.

The field of supply of gas for cooking was still far from filled. For example, if a town of 220,000 inhabitants were in question, it would have taken for cooking purposes in 1905 (say) 198 million cubic feet of gas. But when all the cooking there should be done by gas, it could be calculated that no less than 550 million cubic feet of gas would be disposed of by the gas-works for this purpose in a year. The extent of the use of gas-cookers was only about 55 per cent., and was still far behind that of bath-water heaters, &c. In regard to the heating of dwelling-rooms, the extent of heating with solid fuel from central stations as compared with that of separate fires, indicated that there was greater room for its extension than for gas heating. But with sufficiently large stoves, there was also room for more extended use of gas in this direction. If we allow only two gas-fires for each house with more than four rooms, the gas consumption for heating in a town such as has been mentioned would amount to 304 million cubic feet per annum. This town consumes about 90,000 metric tons of coal for domestic, and about 100,000 tons for industrial purposes. The heat afforded by the latter could be obtained by a consumption of about 3700 million cubic feet of gas only.

Herr Kobbert went on to say that such a capacity could be most properly attained by a simplification of the buildings and apparatus for gas-works, and by effecting a better recovery of the bye-products. To this end, the washing of the gas should be carried out by means of Feld's apparatus* as made in Germany by a firm at Zehlendorf, near Berlin. This apparatus had been installed at Königsburg, and was giving very good results. For instance, 98 per cent. of the ammonia was recovered from the gas with sulphate of lime only; and thus without the intervention of any intermediate process a solution of sulphate of ammonia was obtained. Ammonia was thus recovered from the gas much more economically. By this method, 4 million cubic feet of gas could be washed on the space allotted to only 1¾ million cubic feet per diem with washing apparatus of the ordinary type.

In order to equalize the fluctuations in consumption according to the coldness of the winter, Herr Kobbert recommended the gas industry to turn to closed coke-stoves, which could be heated with coal gas as well as with coke gas or water gas. In this connection, he referred to a communication recently published, in which Mr. Schlicht (at the Society of Arts) recommended gas-works to further the use of close coke-stoves, only that more coke might be used for heating rooms.† The author, however, proposed also to use this coke in a suitable gaseous condition in small towns. Thus towns would not only be freed from soot and smoke, but also be relieved from sulphuric acid. He supported his views by quoting a great number of statistics, and stated his opinion that gas having a net calorific value of 450 B.Th.U. per cubic foot at 59° Fahr. could quite well be sold for 2 pfennige per cubic metre (6·8d. per 1000 cubic feet). In regard to the hygienic improvement which would ensue from such a gas supply, the author quoted the views of Rubner, Ascher, and Renk. He did not put forward his ideas merely as interesting dreams; they were rather earnest and sober calculations.

* See "JOURNAL" for April 9, p. 85. † *Ibid.*, May 14, p. 454.

Reinforced Concrete Tests.—Reinforced concrete tests made at the University of Wisconsin testing laboratories during the past four years indicate that concrete cracks before evidences of the break can be detected by the eye; and that after it has cracked, though only minutely, its strength in tension is zero. Comparative tests of reinforced and plain concrete bars made at the University show that the first indications of cracking appear on the reinforced beams at about the same load as that at which the plain beams fail. It is therefore considered probable that concrete reinforced with steel will not stretch more before cracking than plain concrete, and that consequently the tensile resistance of concrete should not be taken into consideration in reinforced concrete design.

THE ADJUSTMENT OF THE GAS SUPPLY TO INVERTED BURNERS.

The New "Nico" Adjuster.

THERE were many good points in the paper read by Mr. Harold E. Copp, of West Bromwich, on "Incandescent Gas Lighting, with Special Reference to Inverted Burners," at the Dublin meeting of the Institution of Gas Engineers. But there was one statement in it to which we wish to take exception. He was speaking of the adjusting of the gas to inverted gas-burners; and, in this connection, averred that a needle valve in which the gas issues from an annular space tended to lower the efficiency, in comparison with adjusters in which the hole is maintained fairly circular in form. He went further, and announced his preference for dispensing, as far as possible, with the use of mechanical adjusters; declaring that he finds that it is generally more satisfactory, when making installations of incandescent burners—especially of the inverted type—to take a record of the pressure at the point where the burners will be fixed, and to adjust them to these exact conditions in the test-room before they are sent out. But turning to the discussion, it is seen that Mr. W. R. Herring combated both points in the statement—asserting that he finds the burner with the type of adjustment condemned by Mr. Copp gives the best efficiency, and suggesting that it is practically out of the question to take the pressure at any position in which a burner is to be fixed, and to exactly regulate the burner prior to fixing for that position. Mr. Herring added that it is physically impossible to know what the pressure will be in any particular locality at any given time, unless every house is governed independently of the street-mains; and further, the success of a system must not depend on the adjustment of a burner for the position it has to occupy, but burners must be of such a character as to meet all varying conditions to be found at the present time.

These statements, diametrically opposed as they are, and coming from two practical men, are interesting; but of the two, our views are entirely in accord with those of Mr. Herring—practical experience over some months having been obtained from trials of a new form of gas-adjuster, known as the "Nico," that the New Inverted Incandescent Gas-Lamp Company, Limited, are now placing on the market. However, dealing first with the question of pressures, it is absolutely impossible, as Mr. Herring points out, with all the various disturbing influences that affect pressure throughout the distribution network, to assure constancy in pressure of the delivery at any house, unless that house be specially governed. Assuming that it is so governed, there again come in the disturbing influences inside the house, through the variations in the numbers of points of lighting, and through the intermittent use of gas-fires and cooking-stoves, all of which make it practically impossible to so adjust a burner at any given position at the time of installation so that the burner will need no further adjustment. In the very room in which this article is being written, the gas for the desk light is furnished by a branch from a pipe supplying a gas-fire, and the pipe supplying the gas-fire is taken from one supplying a cooking-range in the scullery on the ground floor. In the same house, a bed-room gas-fire derives its supply from the same pipe that feeds a pendant in the dining-room. These are not extreme instances of the gas-piping arrangements in a house; and how, we ask, is Mr. Copp's preference for adjusting his inverted burners before installation to apply to fittings subjected to such fluctuations of gas pressure as is produced in a house by gas fires and a cooker? Before the use of the "Nico" adjuster on the desk inverted burner previously referred to, the fluctuations of light were considerable, owing to the vacillating supply pressure; but the adjuster has given such ease of instant regulation while the burner is in use, that a uniform illuminating power is now readily maintained. Pressure, too, is not the only disturbing factor; there are the mutations in the composition of the gas, especially where water gas is mixed with the coal gas in varying proportions according to varying demand. Experience therefore leads us to agree with Mr. Herring, that what is wanted is a burner of such a character as to meet all the varying conditions in supply at any point; and the nearest approach to such an ideal burner that is procurable to-day is one fitted with a positive and sensitive mechanical gas-adjuster. Regarding the point as to such adjusters lowering efficiency, we will deal with that towards the close of this article by quoting some authoritative tests.

Previous to the advent of mechanical gas-adjusters, the only means of regulating gas and air supply were by the gas tap and the collar by which the primary air supply was controlled. But with a really good mechanical gas-adjuster, the air-supply holes need no regulation (within, of course, reasonable limits). The gas-tap and the air-collar are at the best crude, cumbersome, and unsatisfactory means of adjustment—particularly for inverted gas-burners. They lack the essential refinement; and it is the mechanical gas-adjuster that has proved this by the increased efficiency that is, as a matter of fact, realizable by its use. It is the fine adjustment of the proportion of gas to the air supply that this means of regulation affords—at all times, and under all conditions—that ensures the complete combustion and the fullness of flame temperature which cause the mantle, under the conditions of use, to render its maximum duty.

The construction and the reliability of a gas-adjuster must, of

course, be of great importance in the production and maintenance of efficiency by its application; and it is found that the new patent "Nico" regulator is constructed on such scientific principles that a perfect jet is realized, and it is also so strongly yet simply made that its refined movements are not in any way affected (writing after an experience of three or four months) by the heat or other influence to which it is subjected by the position it occupies above the burner. It is not found that the velocity of the gas is in any way impeded; but it is found that the hole through which the gas is injected permits the gas to pass in a hollow or crescent shaped jet, which practical trial pronounces preferable to a solid stream of gas. We anticipate that research would find that the reason for this is that such a jet sets up an eddying motion in the bunsen tube, and thus plays its part in the securing of a perfect mixture. The eccentric action of the crank on the inside cylinder of the adjuster makes it impossible for the

The "Nico" Gas-Regulator, shown fitted to, and separate from, Burner.

needle to become tight; and the experience is (as previously mentioned) that, after some months' continuous use, the same sensitiveness of the regulator to the slightest touch obtained at the beginning of use is preserved. This is a very essential condition with regulators of the kind named; for they must not be a source of worry to the consumer, or their frailties would bring the incandescent system itself into disrepute. Another essential in connection with such regulators is that they must not be the seat of small but nasal-offending escapes of gas. We have found the "Nico" regulator to be absolutely innocent in this respect; and, as a matter of fact, between the operating spindle (on the end of which is a milled head for facilitating the movement by hand) and the body of the regulator a spring is placed, which renders it perfectly gas-tight. The new gas-adjusting fitment takes the place of the ordinary injector; and therefore the burner is not greatly lengthened by its use.

There are other points which might be dwelt upon in praise of such mechanical regulation as that afforded by this new "Nico" adjuster; but we will not burden this article by going into them. The two outstanding advantages of such an adjunct to the incandescent burner are: (1) Its universality in application—that is to say, its suitability (without special nipples) for any pressure, for gas of any composition, and therefore for any town, premises, or position; and (2) its efficiency-producing capability, through the refinement ensured. It places in the hands of the consumer the convenience of a ready means of adjustment while the burner is in use, and of keeping the aperture in the injector clear without injuring that aperture by the rough application of such clearing instruments as pins, to the detriment of results.

With regard to the efficiency of the burners fitted with the "Nico" adjuster, Messrs. Alexander Wright and Co., Limited, have made a series of photometrical tests for the New Inverted Company, the results of which we are free to publish. The gas used in these tests was stored gas of the Gaslight and Coke Company, containing a proportion of carburetted water gas, and certified at the testing-stations as being of 16-candle power, consumed in the "Metropolitan" No. 2 argand burner. Check tests were made by Messrs. Wright during the progress of the tests to ensure constant quality. The calorific power was also tested by them, and found to be 540 B.Th.U. gross.

The first tests refer to the No. 4 "Nico" inverted burner and the bijou No. 5 "Nico;" both being fitted with the patent adjuster. The readings were:

No. 4 New Inverted Burner, with Adjuster.

	60° South.
Consumption	3·4
Illuminating power, candles	65·5
Candles per cubic foot	19·26

Bijou No. 5, with Adjuster.

	60° South.
Consumption	1·3
Illuminating power, candles	30·5
Candles per cubic foot	23·4

In considering these tests, the facts preceding the figures as to the characteristics of the gas supply must be borne in mind. Having regard to these characteristics, the efficiency of the No. 4 "Nico" inverted burner per cubic foot is excellent; and the efficiency per cubic foot of the bijou burner is something worth thinking over in these days when both economy and high efficiency are demanded by the public. Here we have shown an efficiency of 23·4 candles per cubic foot of coal and carburetted water gas of 16-candle power, tested in a "Metropolitan" No. 2 burner.

The New Inverted Company have also been trying the effect of the new patent adjuster on vertical burners; and using the various forms of the Welsbach-Kern burner, Messrs. Wright and Co., in their photometrical tests, have found remarkable improvements in duty per cubic foot—particularly with the lower gas consumption, and with the No. 2 Kern. The figures are so clear that it is needless to point their testimony by remarks of our own.

No. 2 Kern Burner, fitted with Ordinary Nipple.

Consumption	2·9	2·5	2·2
Illum. p., candles	53	44	34·5
Candles per C. F.	18·9	17·6	15 7

No. 2 Kern Burner, fitted with Patent Adjuster.

Consumption	3·4	2 8	2·3
Illum. p., candles.	65	58	47
Candles per C. F.	19·1	20·7	20·04

No. 3 Kern Burner, fitted with Ordinary Nipple.

Consumption	4·3	4·2	3 5	3·2
Illum. p., candles	86·5	80	69	61
Candles per C. F.	20·1	19	19·7	19

No. 3 Kern Burner, fitted with Patent Adjuster.

Consumption	4·1	3·8	3 6	3·5	3·4	3·03
Illum. p., candles.	82	80	76	73	70	63
Candles per C. F.	20	21	21·1	20·8	20·5	20·8

No. 4 Kern Burner, fitted with Ordinary Nipple.

Consumption	6 24	5·9	5·25	5·1
Illum. p., candles.	114	112	100	80
Candles per C. F.	18·2	19	19	15·7

No. 4 Kern Burner, with Patent Adjuster.

Consumption	5·6	5·25	5·1	4·6
Illum. p., candles.	105	100	97	78·5
Candles per C. F.	18·7	19	19	17

The regulators are also to be made for "C" burners, from which equally good results may be expected.

We are satisfied that the merits and utility of mechanical adjustment, and the improvement and maintenance of burner efficiencies, are abundantly certified by the experiences with the new "Nico" regulator.

ITALIAN GAS SOCIETY'S ANNUAL CONFERENCE.

Among the many annual meetings which have just taken place, we must not omit to record the 36th conference of the "Gasisti d'Italia," which was held in the interesting old city of Bologna during the three days June 17, 18, and 19. Notes of the meeting, kindly sent by one who was present, enable us to give the following review of the proceedings.

Last year there were 135 members of the Society; and bearing in mind the characteristics and distances of the country, it must be considered satisfactory that about half, or 60 of the members, were present at the meeting. They met in the Atrium of the Communal Theatre, the acoustic properties of which—however satisfactory for a concert or opera—proved very defective for a gathering of gas engineers. The first meeting on Monday, June 17, was taken up with purely business and formal matters. The minutes of last year's Conference at Milan, which it will be remembered was more or less of an international character, were approved, and the financial statement passed. The President of the year—Signor Ing. F. Rebuffel, the Manager of the municipal gas undertaking at Bologna—was next installed in the presidential chair; but, in accordance with custom, this does not involve, as with us, a presidential address. Some new members were admitted to the Society; and the record was read of deceased members. The Committee for the awarding of prizes to workmen was appointed, and also a delegate for the consideration of the technical papers to be read at next year's meeting, which it was decided later on in the proceedings should be held at Venice. No papers having been prepared for this year's meeting, Sig. Chavannes, who had been nominated last year to deal with them,

had no report to present. This finished the first ten items on the *agenda*, and closed Monday morning's proceedings.

The afternoon was occupied by a visit to the Bologna Gas-Works; and it was a notable feature of this Conference that it was the first time in the history of the Italian Gas Society that their annual meeting had been held under the auspices of a municipal gas undertaking. This gave the visit to the town's gas-works at least a new and distinguishing aspect. There was not, however, anything of particular note to be observed in the manufacturing plant; though, for Italy, there was something of novelty in the manufacture of water gas on the Dellwik-Fleischer process. The plant had, we believe, been installed by the firm of MM. Siry, Chamon, et Cie., of Milan.

The second day's proceedings opened with a discussion on the International Photometric Committee, and Sig. Böhm (of Milan), who is the representative of Italy on the Committee, spoke at length on the present position and future prospects of the question. Following this, a good many members aired their views on the semi-political problem of a compulsory cessation from work once a week. The English holiday of from Saturday noon to Monday morning is receiving a fair amount of imitation. A constitutional question was next raised as to whether water engineers should be admitted to the Society; but its further consideration was postponed until next year. The grievances of taxation are everywhere more or less prominent, but perhaps nowhere more than in Italy; and Sig. Pouchain (of Rome) drew attention to various anomalies which existed—such, for instance, as the taxation of gas-mains but not of water-pipes.

The small town (5000 inhabitants) of Cento, and its little gas-works, built under the engineership of Sig. Calzavara, were visited in the afternoon of June 18. The members met with a hearty reception at the hands of the Municipality, who had provided music and floral decorations for the occasion. In the evening, the Hôtel d'Italie at Bologna was the scene of a very friendly dinner given by the municipal gas undertaking, represented by Sig. Gaetano Giovannini and Sig. Carpi, the President and Vice-President respectively of what we should call the Gas Committee of the Municipality. Sig. Lacombe (of Milan) spoke in French as to the same technical and other difficulties of gas administration being met with by municipalities as by gas companies.

On Wednesday morning (June 19), the subjects of the utilization of bye-products and the possibilities of the distribution of gas for heating were discussed, among others, by Signori Chamard (Florence), Margary (Leghorn), Beria (Turin), Laeng (Brescia), Sospisio (Trieste), and Calzavara (Venice). After methods of meeting the ever-troublesome naphthalene had been mentioned, Sig. Sospisio discussed at some length the question of carburetted water gas from the Italian point of view. He described the various systems in use—carburetting by means of petroleum being the best and most general. But in Italy the question of Customs duties comes in; and this, notwithstanding a recent reduction of duty, makes the price prohibitive. Benzol had to be resorted to instead. Self-enrichment, or auto-carburetting, he regarded very sceptically. Some people even yet thought water gas meant turning water on into gas-mains! Lastly, he combated effectively the popular prejudice as to water gas being exceptionally poisonous and dangerous. After Sig. Beria had also spoken, Herr Rottenbach expounded the merits of Dr. Bueb's system of vertical retorts; but there was no discussion of this topic.

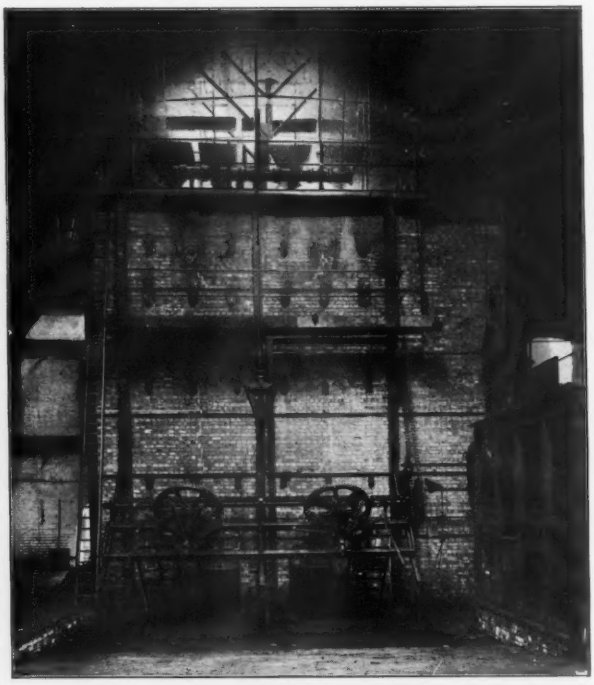
Re-assembling in the afternoon, Sig. Rebuffel described, in considerable detail, various kinds of prepayment meters, which had mechanical devices supposed to prevent fraudulent practices on the part of consumers and others. He showed how, by abstracting the water, gas could be obtained without its being registered; and he further explained a particular system of his own. Sig. Chamon answered many of the criticisms that had been brought against gas-meters.

This concluded the technical business of the Conference.

It was then resolved, as already stated, to hold next year's meeting in Venice, and the year following at Naples. It was also decided that our Italian contemporary "Il Gaz" (under the able editorship of Sig. Cap. Vittorio Calzavara) should be the official organ of the Society. The last function of all was the annual dinner, at which the President, Sig. Rebuffel, suitably expressed the acknowledgments of the Society to various persons, and especially the officials of Bologna. In conclusion, it must be said that, as usual, the whole of the proceedings, both technical and festive, was marked by extreme cordiality on the part of all. Thus it is that the official title of "*Conferenze Amichevoli*," or friendly conferences, of the Italian Gas Society is so deserved, and their annual meetings thoroughly beneficial and enjoyable.

Wood-Stave Water-Pipe.—In a letter to "Engineering Record," Mr. G. T. Prince, of Denver (Col.), offers some favourable remarks on wood-stave water-pipes, especially in regard to their durability. He says Denver has constructed and maintained for many years pipe of this kind in sizes ranging from 20 inches to 48 inches in diameter. There is still in use a 48-inch stave pipe constructed in 1884, a large portion of which is in good condition. The Denver Union Water Company have in service upwards of 75 miles of wood pipe, and are expecting to construct nearly 20 miles more during the coming season; and Mr. Prince remarks that had it not been found, through many years of experience, that this class of pipe is desirable, the Company would not be expending $500,000 this year in the construction of more of it.

THE WOODALL-DUCKHAM VERTICAL RETORTS AT NINE ELMS.



The Woodall-Duckham (Continuously Carbonizing) Vertical Retorts at the Nine Elms Works of the Gaslight and Coke Company.

[The light in the retort-house did not permit of a clear view of the settings being secured. But here for the first time we are able to publish a photograph, showing the exterior mechanism of the conveying plant running under the retorts. A photograph of the top equipment was given on June 4 (p. 638) when describing the Bournemouth installation.]

THE programme for the recent conference of the Institution of Civil Engineers included a visit to the Nine Elms works of the Gaslight and Coke Company. This took place on Thursday afternoon, June 20, when about 40 engineers availed themselves of the opportunity of visiting the works. Mr. T. Goulden, the Chief Engineer of the Company, showed the visitors over the station. The installation of Woodall-Duckham vertical retorts were first inspected. These consist of two settings, each of four retorts, with one generator for heating both settings. In all details, they are the same as the installation at Bournemouth, which was fully described recently in the "JOURNAL" (June 4, p. 638). The retorts had only been set to work a few days previously; but they were running continuously, and in a satisfactory manner. The engineers were much struck with the continuous and even working, and also with the quality of the coke, which much resembled oven coke. On leaving the vertical retorts, the new installation of inclined retorts and the hydraulic cranes on the wharf were visited. The party were afterwards entertained at tea by the Company; and a hearty vote of vote was passed by those present both to the Company and Mr. Goulden for their kindness in permitting them to visit the works, and for the facilities afforded. Among the engineers present were Sir George Livesey, Mr. Henry Woodall, Mr. Botley, and Mr. Price.

Gas Engineering at the Leeds University.

At a recent meeting of the Court of the University of Leeds, under the presidency of the Pro-Chancellor (Mr. A. G. Lupton), Professor Smithells announced that the Institution of Gas Engineers had decided to establish a fellowship of the value of £100 a year in connection with the University; and he moved certain modifications in the ordinance relating to the degree of Bachelor of Science, and they were adopted. "Gas Engineering" and "Fuel and Metallurgy" have now been added after "Mining Engineering" as principal subjects in which the degree, with honours, will be awarded. We hope to be able shortly to give full particulars of the course in "Gas Engineering;" Professor Bone, who is at the head of the Fuel and Metallurgy Department, and his colleague in Mining (Professor Thompson) being now busily engaged in getting out their joint prospectus. When it is ready, they hope to meet with a prompt response in the way of students. Meanwhile, we learn that the new buildings are practically finished, and active steps are being taken for their equipment. This is expected to be completed next month or in September, and the installation to be in full operation by October.

REPORTS OF THE COMMISSIONS APPOINTED BY THE GERMAN GAS ASSOCIATION.

ELECTROLYSIS COMMISSION.

The report of the Electrolysis Commission presented to the Mannheim meeting of the German Gas Association contains an account, firstly, of the electrical conditions obtaining in certain other towns over and above those referred to last year,* and also of the phenomena in a town provided with gas and water supplies but having no electrical tram-lines, or at least no tram-lines with uninsulated conductors; secondly, of a further examination of the experimental methods which were described in Dr. Haber's report on the former occasion.†

Electro-Physical Measurements.

The electro-physical measurements quoted below were obtained by Herr Besig in the same manner as already outlined. The first town mentioned is Solingen, one of the places which informed the Commission three years ago that nothing was known about corrosion of the gas and water pipes. Eighteen months since, however, some of the tram-lines had to be renewed, and destruction of the mains became evident. The phenomena in Solingen are peculiar, inasmuch as the stray currents from the tram-lines have done harm over a large district, even to a distance of 2½ miles. Solingen contains two tramway systems, each possessing its own generating station; the two stations being quite close together in a part of the town where the different lines join. Current is only taken from the lines in the immediate neighbourhood of the generating stations; other special return conductors not being employed. Roughly south of Solingen is a suburb named Höhscheid, to which trams run; while west of the town, at a distance of some two miles from Höhscheid, is another suburb named Ohligs, served by trams from the common centre along a totally different route.

The trams run later at night to Ohligs than they do to Höhscheid. Experiments carried out at the latter place during the interval between the cessation of the service there and the cessation of the Ohligs service, have shown that the water-main leading from Solingen to Höhscheid receives return current across country from Ohligs, and that the water-main is raised by the stray currents from Ohligs to a higher potential than that to which the tram-lines near the pipe are brought by the actual passage of trams along them. This is explained by the fact that the line from the generating station to Ohligs is 4½ miles long, exhibits a high resistance, and is not provided with a proper return conductor. Thus much of the current escapes from the rails, passing into the earth and becoming evident even at so great a distance as 2½ miles away. Hence, as a rule, the water and gas mains in Höhscheid are positive in respect of the rails, whereas it would be expected that they should be negative. The chief danger zone is naturally in the neighbourhood of the generating stations, where the average P.D. from the mains to the rails is 2·5 volts, and the maximum P.D. 4 volts. In this part of the town many gas and water pipes have been uncovered, and are shown to be seriously corroded.

The second place where measurements have been carried out is St. Gallen, in Switzerland, which is noteworthy, because it is the only town yet examined where the positive pole of the dynamo was at the time of the investigation connected with the rails of the tram service. It will be remembered that the first paragraph of the rules drawn up by the Electrolysis Commission for the avoidance of electrolytic corrosion states that the negative pole should be connected with the rails; the object being to limit the danger zone to a small area just round the taking-off points, so that the condition of the mains can be easily watched over. The experiments carried out at St. Gallen have brought to light the defects introduced by the opposite method of construction; for over by far the greatest portion of the district served by the trams the pipes were electro-positive towards the rails. The track at St. Gallen consists mainly of one line 5 miles long, which was supplied with current from a cable 330 yards long at a point 2 miles from one end. A second very short cable passed from the generating station to a little branch line which is arranged as a loop. As these two cables were not balanced, the second carried nearly all the outward current—*i.e.*, even a great part of that which actuated the main line. Hence P.D's. of considerable magnitude were found to exist between the two points where the rails were fed with current, although the spots in question were close together. The mean P.D. between the two feeding points was found to be 3·5 volts, and the maximum 5 volts. The average P.D. in those districts of the town where the pipes were positive towards the rails was 2 volts—5 volts being the maximum; but near the generating station, where the pipes were negative in respect of the rails, the corresponding figures were 2·5 and 4·2 volts. The P.D. from the extreme end of the track to the generating station was, on an average, 8·1 volts.

It should be added that a considerable amount of interest was displayed by the local authorities in the experiments conducted by the Electrolysis Commission. A few weeks after the work was completed, the polarity of the tram current was changed over; and in order to balance the two cables (which thereby became return conductors), a temporary resistance was placed in the shorter. A request was afterwards sent to the Commission that the new conditions should be examined, more particularly with the object of ascertaining whether a third return conductor should be installed to take the current away from the 3 miles of track at the end of the longer tramway route. When Herr Besig repeated his visit last December, he found that even the small alterations that had been made had effected considerable improvements. In the places near the generating station where the pipes had originally been negative towards the rails, they were now positive; the average P.D. being 0·7 volt, with 1·3 volts as a maximum.

In February last, a preliminary examination was made of the conditions prevailing in Cassel—a town having a very lengthy tram service, in which the current passes back through the rails to two positions about 300 yards away from the generating station, where it enters proper insulated leads. Although the Managers of the Municipal Gas-Works were not aware of any destruction of their pipes, it was found that several of the mains crossing the rails in the immediate neighbourhood of one of the taking-off points were corroded. One gas-main in particular was very severely injured; being completely eaten away in a certain spot to such an extent that the gas escaped violently directly the clay soil round it was loosened. The general conditions in Cassel bear out the assertion already made by the Electrolysis Commission—viz., that the fact that no evidence of injury done to the gas and water mains has yet come to the knowledge of their proprietors is no proof that such injury has not already been done.

Electro-Chemical Experiments.

During the past year, numerous electro-chemical experiments have been carried out by Herr Besig, with the assistance of Dr. Liese, under the supervision of Dr. Bunte and Herr Reichard; the object of the investigations being to gain further experience with the non-polarizable test-electrode devised by Dr. Haber, and to compare the figures given by the earth amperemeter and the earth coulometer with the actual conditions that obtain in the spots under examination. First of all, some laboratory tests were carried out in Karlsruhe; boxes being filled with soil in the manner already described, and currents of known strength being sent through them between two plates of iron arranged symmetrically on opposite sides. It was found that the operation of filling the boxes required great care and practice, for if they were rammed too tightly the results were too high, and *vice versâ*. But when sufficient care was taken in preparing the pastes and in filling the boxes, the results of the experiments agreed well with the phenomena actually observed in the ground. Naturally the difficulty of imitating the conditions in the ground within the experimental boxes is increased owing to the fact that the earth itself often varies in composition, and that the pipes which act as conductors for the current vary in size, distance, and position with respect to the rails. Nevertheless, at the places in Karlsruhe where experiments were made, the laboratory results were satisfactory; the figures obtained for the current densities agreeing fairly well with the figures calculated from the P.D's. and the resistivity of the earth.

In one of the worst spots in Karlsruhe where the pipes cross the tram-lines, the mean current density close to the pipe was as high as 1 milliampere per square decimetre [9·3 milliamperes per square foot] while the P.D. between the pipe and the earth was on an average 4·5 volts. On exposing the pipe, its surface was found to be almost uniformly corroded, and the earth surrounding it was stained all over with considerable quantities of oxide. In certain places the pipe was eaten into holes several millimetres deep and large enough to hold a finger; the residual metal being sufficiently soft to be cut with a knife. The authorities of the Karlsruhe gas and water supplies, also those of the tram system, have agreed that the state of the gas and water mains has become intolerable. After measurements had been made in other places where the P.D's. were much smaller than those mentioned, and had shown that numerous pipes were already seriously corroded on the surface, it was decided that comprehensive means should be taken to improve the return conductors for the tram current.

Measurements of the electrical phenomena prevailing in the City of Strasburg were first made at the end of 1904. Shortly after they were brought to a conclusion, an opportunity arose for uncovering a pipe for a distance of about 150 yards. The pipe was found to be so seriously corroded that the Commission were requested to make a fresh examination, when a somewhat obscure state of affairs was brought to light. Electro-physical measurements proved that at the place in question the pipe was not being exposed to severe injury by current escaping directly from the rails, for the average P.D. between them varied only a trifle on either side of zero. Nevertheless the fact that the pipe was corroded mainly on that part of its surface which was nearest to the rails seemed to show that stray currents must have led to the injury; the true cause being either a current travelling at right angles to the axis of the pipe although not passing from the pipe to the rails, or (less probably) some condition which had improved before the time when the measurements were made. The former suggestion has seemed more likely because the River Ill flows close to the injured pipe, and it is quite possible that current may have left the latter for the river or for the ground water. It is however, conceivable that the destruction of the pipe may have

* See "Journal," Vol. XCV., p. 164. † *Ibid.*, p. 578.

been due to some purely chemical action—the soil in the neighbourhood containing a good deal of decomposing matter. On the other hand, analysis of the soil and estimation of the carbon dioxide in it have not borne out this supposition.

A third series of measurements, made last October, led to no definite conclusions on the subject; and the investigation could not be pursued further owing to the fact that the street had been in the meantime laid with asphalt, which had doubtless affected all the conditions. Further measurements have also been carried out in other parts of Strasburg, in places where it seemed probable that corrosion of the pipes might have taken place. Where the conditions were favourable, trustworthy figures were obtained without much difficulty. In particular, at the spot where the return conductor nearest to the tram current generating station was connected with the rails, the current density in the immediate neighbourhood of the pipes was as high as 0·5 milliampere per square decimetre; while the pipes were a trifle more than 1 volt positive in respect of the rails. The earth was found to exhibit much higher conducting power than the soil in Karlsruhe; and at this spot it was ascertained that the pipe was seriously corroded immediately underneath the rail. It was also noticed that the earth current fell to half its original value when a resistance was inserted in the short return lead; the P.D. between the different taking-off points being thereby greatly diminished. In other parts of the city where the soil was somewhat heterogeneous, and especially where the ground water lay as high as the pipes, electro-chemical measurements failed. The ground water apparently withdraws the return current from the pipes, and it is quite possible that the action of the water alters the conditions prevailing from time to time; and it is also possible that the operation of uncovering the pipes for the purpose of making measurements affects the stray currents to a more than usual extent. It would seem, too, that there may be considerable difficulty in using the wooden amperemeter satisfactorily in such very wet earth; so that this instrument, and also the coulometer, may require modification, especially in regard to their insulation. This point has been referred to Dr. Haber, who has accepted the invitation extended to him to join the Commission.

The Final Report.

Ever since the Commission was first constituted in 1897, exhaustive reports on the conditions found in every town investigated have been prepared, which have been submitted to the President of the Association, and also to the authorities of the towns in question. It has now been decided to draft a general report of all the work done by the Commission, and to publish the result in a pamphlet accompanied by plans of the different towns drawn to uniform scale. This work has already been begun; but it was unfortunately found impossible to have the final report ready in time for submission to the Mannheim meeting of the Association.

Future Investigations.

A joint meeting of the Commission, the German Association of Industrial Electricians, and the Association of Tram and Light Railway Proprietors, was held last December at Halle—the then President of the former Electrical Society, Dr. Kohlrausch, in the chair. At the meeting a debate took place regarding the best method for the future investigation of the electrolysis question. Subject to the approval of the respective Associations, it was decided to create a Joint Commission composed of four members from the Gas Association, and two members from each of the Electrical Societies, with full power to deal with the whole matter; while the latter bodies decided to appoint an Engineer to collaborate with Herr Besig in the actual work. The Gas Association agreed to the proposal, nominating as members of the Joint Commission Herr Nolte, Professor Bunte, Herr Kordt, and Herr W. H. Lindley, with Dr. Haber and Herr Lampelius as additional members in case of emergency. The Electrical Associations, on their part, selected Herr Otto, Dr. Michalke, Dr. Haas, and Herr Cremer—appointing Herr Buschbaum to act in conjunction with Herr Besig. A meeting of the "Joint Electrolysis Commission" thus constituted was held last March in Berlin; Herr Lindley being elected as President, and Herr Otto as Vice-President. The programme of the work to be undertaken during the year commencing with April, 1907, was drawn up at the meeting. It included investigations in the towns of Brunswick, Frankfort-on-Main, and Nuremberg, to be followed by experiments in Cassel, Wiesbaden, and Düsseldorf. The experiments at Nuremberg promise to be peculiarly interesting, because the tram service there is arranged on the three-conductor system; the rails being employed as the neutral lead. As soon as sufficient material is in the possession of the Commission, the new code of rules will be discussed and drawn up; Sub-Committees being appointed to deal with matters of detail.

GAS-METER COMMISSION.

Fabric Diaphragms for Dry Meters.

The greater part of the report presented by the Gas-Meter Commission this year is taken up with a further investigation of fabric diaphragms for dry meters, with special reference to the examination and general behaviour of such diaphragms as are manufactured by the firm of Elster and Co., of Mayence. The general method of preparing such diaphragms from plain or twilled calico, and the gradual conversion of the linseed oil into an insoluble body when exposed to the atmosphere, were fully described in last year's report.* The manner in which linseed oil dries when exposed to the air on glass plates is already thoroughly well known; but experiments do not seem to have been carried out upon its drying when the oil is absorbed within the pores of a fabric. For this reason, special experiments (dealt with below) have been instituted into the behaviour of new fabric diaphragms; while the method of testing old diaphragms for the proportion of insoluble "linoxyn" in them has been elaborated by the late Dr. Homann and Dr. Fischer, as follows.

Methods of Examining Fabric Diaphragms.

The scheme proposed by the Commission for the examination of calico diaphragms impregnated with linseed oil, is divided into two parts; the first part describing the method for estimating the proportion of incompletely oxidized linseed oil (*i.e.*, of the constituents soluble in ether or carbon tetrachloride), and the second part describing the estimation of the so-called linoxyn (that is, the proportion of matter which has become insoluble). For the former purpose a piece of the membrane 50 c.m. long and 6 c.m. wide (roughly 20 inches by 2 inches), weighing 8 to 9 grammes, is weighed without any previous drying. A dry flask holding 250 c.c. is weighed and connected to a 100 c.c. soxhlet apparatus by means of a sound cork. The strip of fabric is loosely rolled up, introduced into the soxhlet, and a proper quantity of solvent (either common ether or carbon tetrachloride) is added. This quantity should be from 20 to 30 c.c. more than is necessary to enable the soxhlet to syphon properly. The apparatus is then fitted with a reflux condenser, and heated over a water-bath if ether is employed, or on a sheet of asbestos over a naked flame if carbon tetrachloride is used, at such speed that the soxhlet fills and empties itself about ten times per hour. At the end of six hours the extraction is stopped; the bulk of the solvent is distilled out of the flask; and the residue is evaporated on the water-bath. The flask is then dried for an hour at 100° C.; allowed to cool thoroughly; and lastly weighed. By deducting the net weight of the flask, the weight of matter soluble in ether is obtained.

For the estimation of the linoxyn, 400 c.c. of a solution containing 20 grammes of anhydrous sodium carbonate per litre are put into a beaker and raised to the boiling point. The strip of fabric removed from the soxhlet apparatus is dropped into the liquid, stirred up frequently with a glass rod, and allowed to boil for half-an-hour; the water that evaporates being replaced by hot liquid, so as to maintain the concentration of the solution. If necessary, the solution may be renewed. The extracted fabric is then washed until it is no longer alkaline—preferably by manipulating it under a tap; and it is then thoroughly dried in the air and weighed. This last weight represents the amount of true fabric in the prepared diaphragm. By subtracting this weight from the original weight of the strip, the quantity of impregnating material is obtained; and by deducting from the latter the proportion of soluble matter, the amount of insoluble linoxyn is left. It should be remarked that the foregoing process is only suitable for the examination of a membrane prepared with pure linseed oil, and would require modification if applied to any material made from a resin varnish. However, as mentioned in the last report, true varnishes have not been satisfactorily employed in constructing the diaphragms of dry meters, and a scheme for their examination is, therefore, not required.

The Oxidation of Absorbed Linseed Oil.

A large quantity of cotton fabric prepared by Messrs. Elster and Co. for use in dry gas-meters, and impregnated by them with linseed oil during January, 1906, was handed to the Government Stamping Department and to the authorities at the Karlsruhe and Munich Gas-Works for examination. The samples were freely exposed to the air and were tested on the same days month by month for 5 months, then put aside for 4 months, and tested once more, and finally tested 12 months after preparation. Both ether and carbon tetrachloride were employed as solvents, the proportion of insoluble matter obtained with each liquid at the three different laboratories and at the dates mentioned being recorded in the following table, where the columns marked A indicate the results obtained with carbon tetrachloride, and those marked B the results obtained with anhydrous ether as solvent:—

Proportion of Total Impregnating Material Insoluble.

Date of Test.	Tested by the Stamping Commission.		Tested at the Munich Gas-Works.		Tested at the Karlsruhe Gas-Works.	
	A	B	A	B	A	B
February, 1906 .	66·9	—	67·2	69·6	—	73·3
March ,, .	68·2	—	70·7	73·4	69·8	73·5
April ,, .	71·7	74·7	73·7	75·3	71·6	74·4
May ,, .	73·5	75·4	—	—	76·4	76·8
June ,, .	74·9	76·1	75·6	77·3	76·5	76·9
October ,, .	76·8	77·5	78·9	79·9	77·0	77·9
January, 1907 .	77·5	79·6	77·9	80·1	—	—

On inspecting the figures, it will be seen that the proportion of oil still remaining in a soluble condition was greater when using carbon tetrachloride than when using ether. This difference is perhaps to be explained by the higher temperature during extrac-

* See "Journal," Vol. XCV., p. 232.

tion. As carbon tetrachloride boils at 78° C., the temperature in the soxhlet is about 75° C.; whereas when ether is employed the corresponding figure is only about 30° C. The difference, however, is of no importance, because the actual purpose of the investigation is merely to elucidate the manner in which the linseed oil oxidizes. It will also be observed that the figures given from the three different laboratories vary somewhat; the main cause doubtless being that it was impossible to spread the oil over the whole surface of the fabric with perfect uniformity. In consequence, the thinner layers of oil dried more rapidly than did the thick ones. It is, of course, not to be expected that the linseed oil should become wholly insoluble, because it contains saturated fatty acids, which do not absorb oxygen. The presence of such unoxidized fatty acids is necessary, or the membrane would not retain the requisite suppleness. On an average, it may be said that not more than 80 per cent. of the linseed oil spread upon the fabric will become insoluble.

The Tightness of Oiled Diaphragms.

Experiments have been carried out by the Government Stamping Department, in an apparatus designed by the late Dr. Homann, upon the impermeability to gas of diaphragms impregnated with linseed oil. This apparatus consists of a massive cylinder of brass, fitted underneath with an inlet and outlet for gas, and a tube communicating with a pressure gauge, reading on an enlarged scale. The tube of the cylinder is closed with a collar holding in place a piece of the membrane under examination. Tests with this apparatus have shown that for all practical purposes fabrics treated with linseed oil are perfectly gas tight. In one experiment when the soluble portion of the oil was extracted from a new diaphragm, or one two months old, in a soxhlet with carbon tetrachloride, the diaphragm became leaky, and the pressure of the gas sank from 15·7-10ths to 7·9-10ths in 10 seconds. On the other hand, when a piece of the same membrane two months old was extracted with ether, the pressure of the gas only fell from 15·7-10ths to 15·35-10ths in 20 minutes; so that it may still have been regarded as almost completely gas tight. Further experiments are required to show whether the membrane may remain almost completely tight to gas even when the soluble portion of the oil has been washed away.

Dr. Schumann, the Chemist at the Munich Gas-Works, divided the membrane sent him into two portions; leaving one half freely exposed to air and wrapping the other up in paper. When the one sample was extracted with ordinary ether one month after being so wrapped up, the proportion of insoluble matter was only 70·5 per cent., having increased very little from the amount shown in the first column of the preceding table. On the same date, a sample of the membrane exposed to air gave 73·45 per cent. of linoxyn when extracted with ordinary ether, 73·95 per cent. when extracted with absolute ether, and 70·75 per cent. when extracted with carbon tetrachloride. Dr. Schumann has also suggested that the oxidation of the linseed oil on the diaphragms might be hastened by exposing them to a current of air or to heat in the same manner as is adopted in the preparation of so-called lithographic varnish; but the Commission do not know whether any experiments in this direction have been carried out.

The Government Stamping Department, however, have tried placing a loosely rolled strip of membrane in a glass vessel closed with a cork, provided with an inlet for air passing almost to the bottom, an outlet leading to a water pump, and a thermometer. On putting the apparatus in an air-bath, heating it to between 70° and 80° C., and aspirating through it a slow current of air dried by means of sulphuric acid, a strip of membrane so treated for 48 hours contained 77·89 per cent. of linoxyn; whereas another strip freely exposed to the atmosphere only contained 75·4 per cent. Very similar experiments carried out by Dr. Fischer on twilled calico freshly treated with raw linseed oil several times and allowed to dry, showed that, after exposure in a similar apparatus for 36 hours, the samples contained 79·8 per cent. of their linseed oil in an insoluble condition when extracted with ether; whereas only 56·9 per cent. of the oil was rendered insoluble when the strips were left hanging up in frames in the laboratory. The membranes artificially oxidized in this manner proved to be perfectly gas tight for all practical purposes. Presumably, if the process were modified in a few respects it might be available on the large scale; but oxidation in a current of oxygen as has been suggested would probably prove too expensive.

Experiments have been instituted by the Government Stamping Department to compare the behaviour of membranes heavily coated with linseed oil with such as bear a smaller quantity. One sample which had been prepared in the laboratory by impregnating linen with pure linseed oil, contained at the time of the test 61 per cent. of its coating in an insoluble form; the other was a specimen of the Mayence material, and contained between 79 and 80 per cent. of linoxyn. Samples of each, 15 c.m. long by 5 c.m. wide, were weighed in tubes on a chemical balance, and were then exposed for three days to a current of coal gas passed through a wash-bottle containing benzol in order to load it with the vapour. At the end of the experiments the strips were weighed as before; but no appreciable difference was noticed in the figures. On inspection, however, the new strip had lost its polished appearance, and felt more sticky than the old one. A second experiment was carried out in a similar fashion for 8 days, using gas without adding benzol vapour. The weights only altered a trifle; but once again the new strip had lost its polish.

It was mentioned in the 1905 report that Messrs. Elster and Co. had prepared numerous fabric diaphragms in the year 1891, and also others so far back as 1884 and 1882. Dr. Fischer has recently taken the opportunity of examining one of these diaphragms dating from 1882. He found the fabric to be pure cotton, but heavier and more closely woven than the material employed to-day. The impregnating liquid had been a raw vegetable drying oil, or such an oil boiled without siccatives. In view of the age of the diaphragm, it was not possible to ascertain chemically whether the oil was actually linseed; but in all probability that was the case, as no other oil dries so well. In certain places the diaphragm contained a small quantity of iron compounds, which presumably came from rust spots round the rivets that held it in place in the meter. When a piece of the membrane free from rust was examined in the Homann apparatus already described, it proved to be perfectly gas tight; for a pressure of 15-10ths did not fall appreciably in a quarter-of-an-hour. On examining it by the process previously given, the proportion of coating material insoluble in ether was found to be 77·3 per cent.

General Remarks on Fabric Diaphragms.

In attempting to pass a judgment upon the general utility of diaphragms made by treating fabrics with linseed oil for employment with dry gas-meters, it is necessary to remember that the methods of making such diaphragms and of testing them have only been gradually elaborated. It is now established that the gas-meter factory at Mayence took much care in making the diaphragms when they began to use them in place of leather; but a few failures cropped up, doubtless owing to a lack of knowledge as to the durability of the oil fabrics employed. The failures may be explained by the circumstance that at the date in question no method was available for ascertaining immediately the diaphragms were finished how they would behave when exposed to gas for long periods of time. Recent experiments have shown what is the best fabric to treat with oil, and also that pure linseed oil is the only liquid fit for use. The experiments have also demonstrated that not more than 79 to 80 per cent. of the linseed oil applied to the fabric ever becomes insoluble.

Although numerous gas-works have found that these fabric diaphragms behave satisfactorily, it cannot be denied that unfavourable results have been obtained elsewhere, and that they have therefore obtained a certain measure of unpopularity. The fabric diaphragms began to lose favour in 1902—about the time when cold carburation was adopted in many factories; and the feeling of distrust spread, although it was not wholly justifiable. Shortly afterwards the Rhenish-Westphalian Branch of the German Gas Association sent round to its members a set of questions relating to the failures that had occurred during the use of wet and dry meters, and asking them for information as to the actual or probable causes. The results tended to show that where the gas was excessively carburetted, it acted more or less prejudicially on dry meters fitted with non-leather diaphragms; but the answers to the questions that were propounded caused these dry meters to appear in a less favourable light than they should, because due allowance was not made in collating the replies for the fact that the overwhelming majority of the meters referred to had leather diaphragms. As a matter of fact, among the 159 gas-works applied to, only between 7 and 12 per cent. were using meters with fabric diaphragms—simply because at the time in question most gas engineers doubted whether such diaphragms were trustworthy, and had therefore not adopted them on a large scale.

On the other hand, it must not be forgotten that leather itself is not of necessity a material which retains its desirable properties indefinitely when exposed to a stream of gas. It is, of course, the best natural material to use; but every meter maker has adopted his own rules for selecting the variety of leather he employs, and his own method of preparing it. Leather is gradually rising in price; its applications increase in number; its supply depends on numerous conditions which are not altogether under control; and for many purposes no substitute can be discovered for it. Therefore, in the opinion of the Commission, it would seem desirable not to abandon the use of oiled fabric diaphragms, but to utilize the experiments that have been carried out, and published, in the production of something better than has hitherto been manufactured. Further investigations are undoubtedly called for in order to ascertain how long a fabric diaphragm containing 79 or 80 per cent. of its oil in an insoluble condition will resist the action of different kinds of coal gas. For this reason Dr. Fischer's test of a diaphragm 20 years old was quoted above. It must not be imagined that the diaphragm tested by him was something peculiar; for at the time many meters were being supplied to the trade fitted with fabric diaphragms. Experiments instituted with the object of determining how long a non-leather diaphragm will remain serviceable consume much time; but that is no reason why they should not be carried out. Perhaps the experimental laboratory of the Association will undertake such a research.

The report of the Meter Commission is brought to a conclusion by a brief reference to the question of re-stamping meters in Germany—on which subject there is nothing further to add to what was stated last year. A short notice follows of other private work done by the members during the period under review.

The King has granted a Charter of Incorporation to the Society of Chemical Industry, founded in 1881 to promote the application of chemical science to arts and manufactures.

MECHANICAL STOKER AT THE GENNEVILLIERS (PARIS) GAS-WORKS.

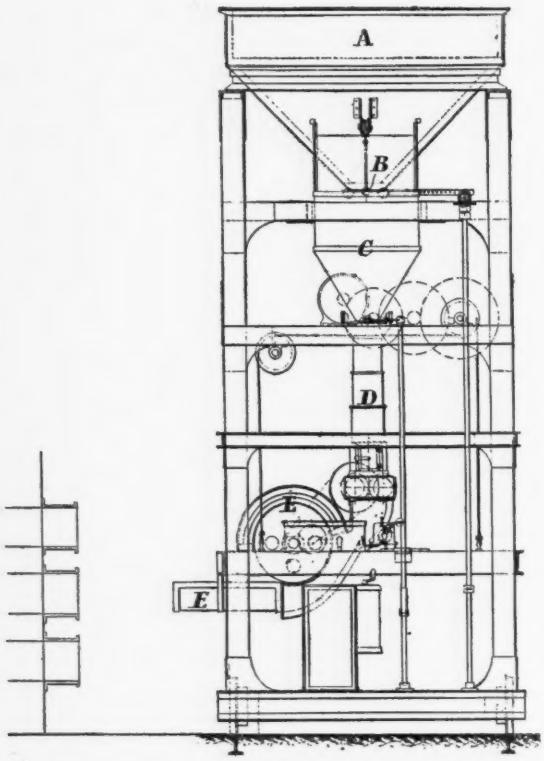


Fig. 1.

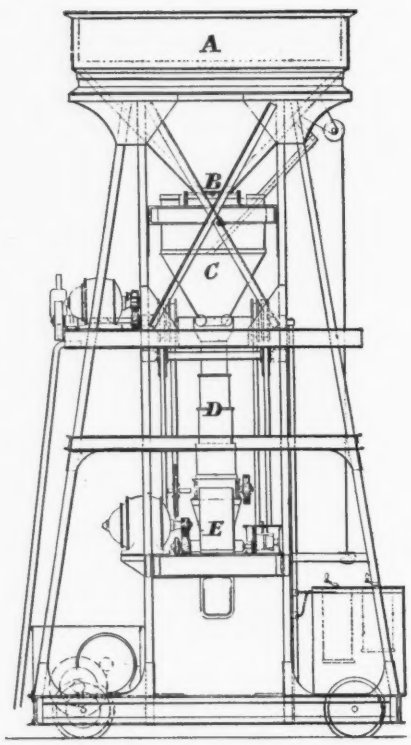


Fig. 2.

At the recent Congress of the Société Technique, M. Cabrier described a mechanical stoker which is now in operation at the Gennevilliers works of the Company supplying the suburbs of Paris with gas. Its principle had been brought under the notice of the members at the preceding congress;* but it was thought that an example of its practical application in gas-works would be interesting.

Fig. 1 is a side view of the machine, showing its position in relation to the retort-bench; fig. 2 is an elevation; and fig. 3 shows cross sections of the distributor—the mechanism by which the coal is projected into the retort. A is a hopper capable of holding from 4 to 4½ metric tons of coal. At its lower part, the hopper is closed by a door B, worked by a lever within reach of the attendant. Below the hopper A is a smaller one C, the maximum capacity of which is about 10 cwt. It is furnished with a regulating plate, by which the charges can be varied in weight from 8 cwt. to 9¾ cwt. This plate is moved by a chain operated from the attendant's platform. The machine is mounted on a framework to which an upward or downward motion is given by means of a winch placed at the top, and driving belt pulleys by the aid of an electric motor. Above the charger E is the distributor and a telescope pipe D connecting it with the lower part of the measuring hopper C. The machine is moved along the fronts of the retorts by electric motors, and every motion is controlled by appliances within easy reach of the attendant.

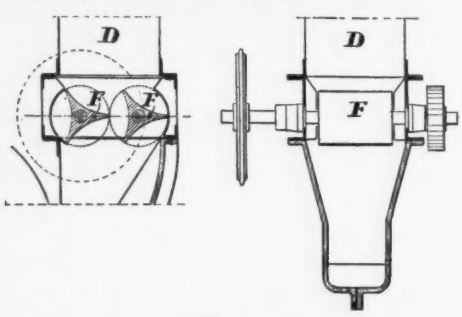


Fig. 3.

The charger consists essentially of a wheel carrying four vanes F (fig. 3), revolving in a cast-iron trough, the bottom of which is not concentric with the vanes—an arrangement which enables a perfectly straight stream of coal to be thrown. On reaching the tangential point, the vane has entirely left the coal, which continues to glide onwards by its own velocity into the channel of the charger. There is sufficient play between the vanes to allow of the passage of the largest pieces of coal; so that there is no danger of the distributor becoming blocked up. The troughs of the distributor are filled in the ordinary way; and the author stated that, whatever the condition of the coal—dry or wet—it always flowed at the same rate. In order to be in a position to charge with moist coal, the measuring hopper C is fitted with a door large enough to allow the passage of even very wet coal in a short space of time. The coal fills the telescope pipe D, and reaches the distributor, by which it is conveyed to the charger.

The machine is completed by an automatic speed reducer. All the electric motors employed are "series," with the exception of the one connected with the charger, which is a "shunt" motor.

* See "JOURNAL," Vol. XCIV., p. 926.

DE BROUWER INSTALLATIONS IN FRANCE.

One of the papers at the Congress of the Société Technique was by M. Lacaze, the Manager of the Cie. Continentale pour la Fabrication des Compteurs, &c., of Paris, who are manufacturers in France of the De Brouwer type of coke-conveyors and stoking machines. M. Lacaze gave a list of the various plants put up; and, as it may prove of use for reference purposes, we give the following summary of his paper.

It was on Dec. 7, 1895, that M. De Brouwer took out his first patent in France for a hot-coke conveyor to do away with the hard and primitive labour of dragging away and quenching hot coke. It is a mistake to suppose that such mechanical methods are only applicable to large gas-works. M. Deschamps, of Albert-sur-Somme, adopted the conveyor for a bench of three beds, of which only two were at work. He reported in 1899 that the plant effected a yearly saving in labour for coke-breaking of about 1400 frs. (£56), and that this would be increased by another 480 frs. (£19) when an elevator and screen were fixed. The first installation in France, however, was at Fontainebleau, in 1897, put up under the responsibility and guarantees of the contractors. It comprised two conveyors, which delivered the coke on to a third one, at right angles to them, and which carried the material to the sorting screens. The trough of the conveyors was 120 mm. (4¾ inch) deep by 640 mm. (25¼ inches) wide; the bottom being formed of a plate 800 mm. (31½ inches) wide by 10 mm. (⅜ inch) thick, with renewable pieces of flat iron. The chain links were 100 mm. (4 inches) centre to centre, and at every seventh link was a cross round bar, 6·4 mm. (¼ inch) diameter.

The next plant put up was at Rouen, in 1898. The 100 mm. (4-inch) links were replaced by others of 320 mm. (12⅝ inches), and the cross-bars were made flat instead of round. With small links it was found that the slightest wear led to considerable stretching of the chain, and the round bars crushed all the pieces of coke which got under them. In the Dijon installation, 1899, a chimney

was adopted for the first time to take away the smoke and steam as the coke was quenched. The coke storage was sufficient to contain a full night's production, and arrangements were made for the direct loading of the railway trucks. At Lyons, in 1900, two plants were erected—one at the Villeurbanne works, and the other at Lyon-Vaise. In both cases, the coke was allowed to fall to the ground from the inclined end of the conveyor, so that it should be drier when sorted later on than if it went direct to the screens after being quenched. At Villeurbanne, the retorts were charged and discharged by the Boutan machines; and at the other works they were inclined retorts built by MM. De Lachomette and Cie. Notwithstanding the almost instantaneous discharge of the whole of the coke from a retort, the conveyor effectively carried away the coke, which trailed over a considerable length of chain.

At Havre, in 1901, was put up the first large coke-tank, holding 1200 hectolitres (42,400 cubic feet). There were four conveyors serving a cross conveyor leading to the first screen. The coke was taken from this by an elevator supplying the hopper. In 1902, at Mouche-Lyon, a conveyor was again adapted to a bench of inclined retorts. Then, in 1903, M. De Brouwer brought out his marvellously simple charging-machine. The same year, it was shown at the Toulon works during the Congress. This led to the installation at Barcelona, and was followed by the introduction, in 1904, of the discharging pusher; thus completing the apparatus for the series of operations. Now a retort 6 metres (nearly 20 feet) long can be charged and emptied as easily as one 3 metres in length, and much heavier charges can be used. Instead of charges of 170 to 180 kilos. (about 3½ cwt.) in a 3-metre retort, a charge of 500 kilos. (nearly 10 cwt.) can be put into a retort 6 metres long. Thus arose the discussion as to the advantages of light and heavy charges. M. Lacaze is of opinion that heavy charges to be carbonized in 6 hours are the best; and some put in 550 to 560 kilos. (11 cwt.) every 8 hours. At Barcelona, the retorts were tapered towards the outlet end, and were 4 metres (13 ft. 1½ in.) long; a pusher (not the De Brouwer) with a single rod was used, as for coke-ovens. It was found that the tapering was not essential, and the mass of coke offered no difficulty.

The first De Brouwer pusher was used in the Toulouse installation, in 1904, which may be considered a complete model of its kind. This pushing-machine had revolving links of cast iron; later on, they were made of steel. Old back-to-back beds of retorts, 3 metres long, were turned into through beds, of 6 metres. In the same year (1904), at Besançon, an old bench was replaced by a new one, and the retort-house roof raised to get in measuring-chambers. At Versailles, an entirely new works was built; but here, as at Toulouse and Besançon, provision was only made for a coal supply for one charge. In the installations at Lille-Vauban and Lyon-Perrache, in 1905, this has been increased to four charges. M. De Brouwer is just now arranging for a coal supply for 96 hours in front of his retorts. At Lille, the coal-hopper is arranged at the end of the bench, with a conveyor running parallel to it from the hopper. At Perrache, there are continuous hoppers. At Lyons, also in 1905, there were put up, in addition to the measuring-chambers, continuous hoppers above them, from which they took their supply. Then when the men got used to the work, the slide between the hopper and the measuring-chamber was done away with, and the charge is no longer measured at all. This is a simplification; and is confirmed by experience at the South Suburban Gas Company's works.*

Subsequent installations were at Bordeaux-Bastide (two benches of seven beds of nines, built by MM. De Lachomette and Cie.) and at Lille-Vauban (for a bench of eight beds of eight retorts arranged in four tiers, built by M. Derval, of Paris). In 1906, in a new plant at Lyon-Perrache, the quenching was effected in a cross conveyor, separate from the conveyor in front of the retorts. Last year, also, retort-house machinery was installed at the Nice and Nancy Gas-Works. Both of these have quite recently been described and illustrated in the "JOURNAL." At the present time, a De Brouwer conveyor is being placed at Nanterre, in front of an inclined-retort bench; and complete new works are being erected at Bacalan-Bordeaux. In Italy, at Naples, retort-house machinery is being adopted for a bench of eight beds; and also the same at the new works for Venice.

In Switzerland, in the year 1898, conveyors to serve nine beds of nine retorts were put up at Winterthur; and again, in 1901, for sixteen beds at Basle and Zurich; in 1899, for seven beds at Geneva; and for eight beds at Berne, in 1901; at Reinthal, in 1902, for three beds of nines; and again at Geneva last year for six beds of nine retorts. The total number of retorts in Switzerland stated to be served by the De Brouwer conveyor is 1175. From these figures and facts, some idea of the mechanical progress made in retort-houses can be realized, and the methods adopted to compensate for losses due to the increased price of coal, and the reduced price of gas consequent upon renewing concessions.

* See "JOURNAL," Vol. XCVII., p. 27.

Onslow's Gas Heating-Burner.—With regard to the reference that was made at the recent Engineering Conference of the Institution of Civil Engineers to the system employed by Mr. A. W. Onslow, the Gas Engineer to the Royal Arsenal at Woolwich, for heating metal, &c., by means of ordinary illuminating gas, it may be pointed out that the burner used was the subject of a patent secured by Mr. Onslow in 1904, a description and an illustration of which appeared in the "JOURNAL" for May 9, 1905, p. 369.

COMBUSTION WITH INVERTED GAS-BURNERS.

Address by Dr. Bunte.

As mentioned in the general report of the proceedings at the recent annual meeting of the German Association of Gas and Water Engineers at Mannheim, which appeared in the "JOURNAL" for the 18th ult. (p. 809), an address was delivered by Dr. H. Bunte, of Carlsruhe, on "The Phenomena of Combustion with Inverted Gas-Burners."

Dr. Bunte explained that in the ordinary bunsen flame about one-half of the air required for the complete combustion of the gas passes through the air-inlets at the bottom of the mixing-tube. The inner lower cone of the flame is formed by the combustion of this air in the gas, and there results the mixture of water vapour and carbonic oxide with hydrogen and carbonic acid (in proportions constituting equilibrium), together with nitrogen. Water-gas and nitrogen pass thence into the outer zone, and there the water-gas is burnt by the fresh supply of air which reaches the outside of the flame. When a mantle is put over this upturned bunsen flame, the water-gas formed in the flame is just inside the mantle, and the secondary supply of air is just outside it. The two meet on the mantle itself; and the resulting combustion of the water-gas raises the mantle to incandescence. Figs. 1 and 2 show the composition of the bunsen flame, and the manner in which it may be split up. The following is the composition of the water-gas mixture in volumes per cent.: Nitrogen, 71·8; hydrogen, 13·3; carbonic oxide, 10; carbonic acid, 4·9.

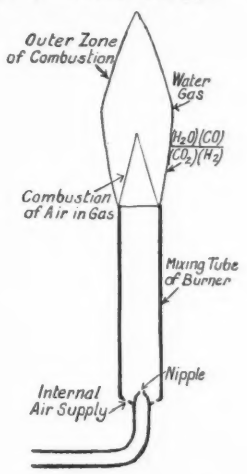


Fig. 1.—Flame of Bunsen Burner.

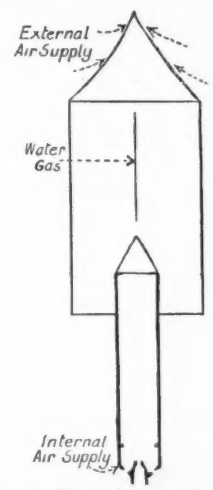


Fig. 2.—Flame of Bunsen Burner Split up.

It was well known, Dr. Bunte remarked, that a slight rise in the temperature effected a relatively very great increase in the light radiated; and it was by taking advantage of this fact that the inventors of high-pressure and intensified gas-burners had secured an enhanced duty. He referred to a drawing of the Lucas intensified gas-lamp, in which the whole supply of air requisite for complete combustion of the gas entered the mixing-tube, and the cones were no longer clearly differentiated, while a certain amount of pre-heating occurred.

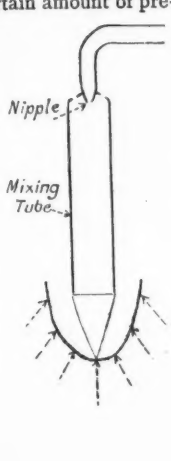


Fig. 3.—Inverted Burner with Hot Mixing Tube.

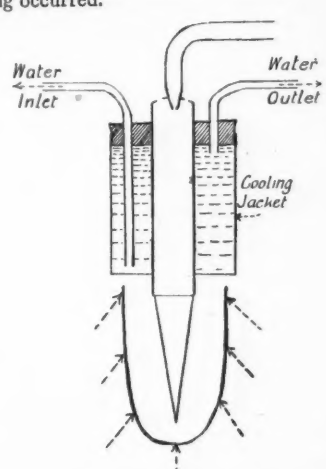


Fig. 4.—Inverted Burner with Cooled Mixing Tube.

Passing on to inverted burners, Dr. Bunte pointed out that, whereas in the ordinary incandescent burner about three volumes of air enter the mixing-tube to one volume of gas, when the burner is inverted the air entering the mixing-tube becomes

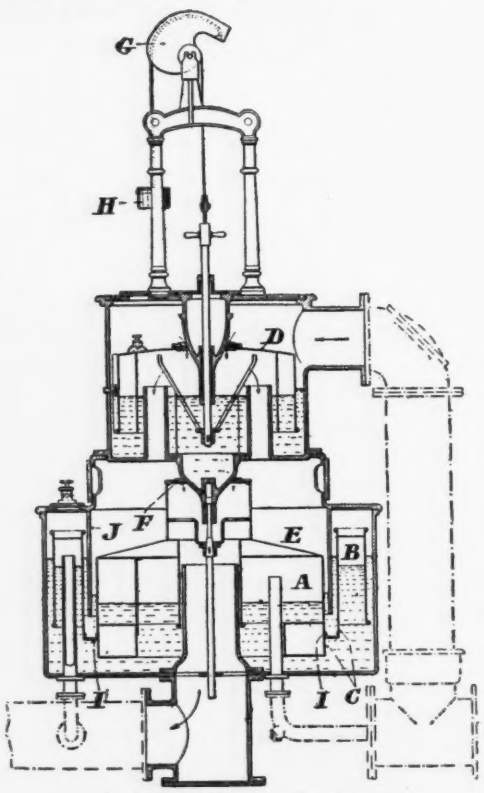
naturally reduced to almost two volumes. The heating of the gas and air which took place when the burner was inverted was, however, advantageous, and quickened combustion. There was the green core of air burning in gas, and outside (but within the mantle) a reservoir of water gas. In the inverted burner, the area of the outer zone was normally smaller, and the temperature became higher. Notwithstanding the preliminary heating of the gas and internal air supply, the inner cone was much contracted, and the outer one reduced in area. But when the mixing-tube was kept cool by means of a jacket with cold water circulating through it, the flame became enlarged, and there was reduction of temperature and loss of intensity of illumination.

The effects alluded to were illustrated by reference to other diagrams. Fig. 3 shows the normal inverted gas-light flame, consuming 105 litres (3·71 cubic feet) of gas per hour, and drawing into the mixing tube 2·32 volumes of air to one volume of gas. He pointed out that the mixing-tube became hot, and that the outer mantle of the flame had an area of 45 square centimetres (nearly 7 square inches). The mean hemispherical intensity of the light was 100 Hefners (91 English candles). Fig. 4 shows the same burner with cooling-jacket attached. It would be seen that the outer mantle of the flame had enlarged to an area of 65 square centimetres (10¼ square inches), and concomitantly the mean hemispherical intensity of the flame dropped to 57·4 Hefners (52·2 English candles).

The investigations on which these conclusions had been based were carried out at the new Experimental Works of the Association at Carlsruhe; and Dr. Bunte appealed to burner-makers to submit their new types of burners for investigation there, in order that the principles governing the action of the burners might be further studied. Many marked advances were, he said, still to be expected in incandescent gas-burners; and the interests of the gas industry would benefit if more attention were devoted to perfecting burners.

AUTOMATIC PRESSURE-REGULATOR.

As briefly mentioned in the notice of the Congress of the Société Technique which appeared in the "JOURNAL" for the 18th ult., a paper was read by M. Heeley (of the Cie. pour la Fabrication des Compteurs, of Paris), in which he described an automatic pressure-regulator brought out by the firm.



An Automatic Pressure Regulator.

He remarked that all gas managers are aware of the practical difficulties met with in maintaining constant pressure at a particular point of the distributing system; as it is impossible to forecast sudden variations in consumption due to the weather or to the simultaneous ignition of a large number of burners. The result is that no pressure-regulating system is complete unless the governor bells are loaded in proportion to requirements; and this is a rather delicate operation, involving constant supervision. Thus the need of a regulator to automatically provide the required pressure has long been felt. The one the author's firm brought before the members ten years ago solved the problem in a very simple manner; but it only gave the desired pressure when the gas was supplied from holders of uniform weight. The principle on which that regulator was constructed has been applied in the instrument shown in the accompanying illustration, but with the addition of certain parts to nullify the effects of initial variation of pressure, and thus prevent it having any effect on the automatic working of the regulator. Hitherto this could not be done without the use of a pressure-unifier placed before the regulators. The instrument also differs from the ordinary governor in this respect—that the bells have regulating seats instead of fixed cones; but the modification does not in any way affect the working.

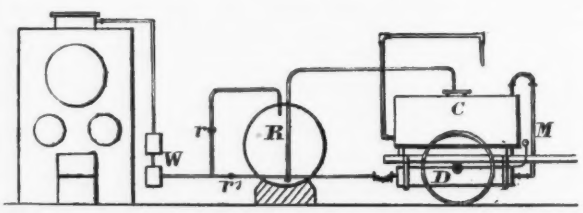
Looking at the general features of the instrument, it will be noticed that the higher part is a reproduction of the old regulator, while the lower part corresponds to the regulating bell C. This is divided by a partition J into two parts, A and B, which are, however, made interdependent, owing to the cross-pieces I, and thus participate in the same movements.

In order to explain the general working, we will take two cases, the instrument being in a state of equilibrium: (1) When the inlet pressure suddenly changes, owing to the displacement of the top lift of a telescopic holder; (2) and when there is an increased output of gas due to the ignition of a large number of burners. In the former case, it is found that this variation acts both above and below the two bells D E. It thus produces equal pressures in opposite directions, which nullify each other, and consequently cannot affect the outlet pressure in any way. In the second case, it is clear that, as in all station governors, there will be a lowering of the outlet pressure, which will impart a descending motion to the two bells. But the only effect of this change of position, as regards the lower bell, is the maintenance of the outlet pressure. This is not so with the upper bell, which, in falling, increases in weight owing to the shortening of the lever arm upon which the weight H acts. The result is that pressure under the upper bell is augmented, and is transmitted through the seat F to the lower bell, to raise the exit pressure to the extent required, which is determined by the form of the cam G and the heaviness of the weight H.

The combination constituted by parts A and B of the bell E may be regarded as an ordinary governor bell loaded in proportion to the output by the action of bell D, which, on account of the variable pressure it determines, acts in the same way as the movable counterweights or charging-tanks employed to alter the weight of non-automatic governor bells in order to obtain the desired pressure.

FILLING TANK-WAGGONS BY COMPRESSED AIR.

Where gas-works are not connected with any railways by sidings, and where the tar and ammoniacal liquor are not sent away in barrels, difficulties frequently arise in the operations of filling and emptying the tank-carts used for the transport of these liquid bye-products. It is not always easy to find railway goods yards where the ground is sufficiently high to allow of the natural rapid flow of the liquor into railway tank-waggons.



M. Sar (of Montpellier) briefly described, at the recent meeting of the Société Technique du Gaz, how he had overcome such difficulties by the use of compressed air. He illustrated his system by the aid of a little sketch herewith reproduced. The first operation consists in the filling of a tank-cart C from the reservoir R. The cock *r* being opened, and r^1 shut, the Westinghouse air compressor W (of the Paris, Lyons, and Mediterranean Railway type) worked by the adjacent steam-engine forces the air back into the reservoir, and the liquor passes without loss or smell into the tank-cart. When the latter is full, the Westinghouse apparatus is stopped. The second operation is charging the two air reservoirs D, on the tank-cart, with compressed air. This is done by simply opening the cock r^1 and shutting *r*; so that on starting the Westinghouse compressor, air is forced into the cylinders, until the gauge at M indicates 4½ to 5 atmospheres' pressure. These two operations take 10 minutes; and the tank-cart is then ready to go to the railway. To discharge the liquor into the railway tank-waggon, no matter where it is, the carter merely opens an outlet cock, and the operation is completed.

The use of compressed air for discharging liquor is, of course, not new. By its adoption, difficulties at the loading station can be got over, time is saved, loss of liquor is avoided, and no smells are given off during the loading and unloading.

THE ASSOCIATION OF WATER ENGINEERS.

THE VISIT TO PARIS—June 9 to 15, 1907.

As a sequel to the twelfth annual meeting of the Association (held at Windsor from the 6th to the 8th of June), the general features of which were described in the "JOURNAL" the following Tuesday (p. 733), the official visit to Paris and its various works of water supply took place the ensuing week, and, in every other respect than numbers, proved an unqualified success. For an Association with a membership roll of 325, a party of 40 (of whom nine were ladies) cannot be considered as representative. But, for various reasons, the visit had to be arranged at a period when parliamentary proceedings and other important engagements claimed the attention of many members who otherwise would have been only too glad to avail themselves of the opportunity of inspecting the water-works of Paris and its environs; and no doubt it will be better if on future occasions such visits as this are arranged independently of the ordinary meetings. Water engineers, as a rule, are busy men; and while a few days may perhaps be spared without inconvenience, an interruption of eleven days is no light matter, especially with Corporation officials, to whom regular attendance at Committee and Council meetings is a duty not readily shirked.

Enough has been said upon this point; and it is pleasant to record the fact that neither the usefulness nor the importance of the visit was prejudiced by the comparatively small number of members who took part in it. On the contrary, had the party numbered 400 instead of 40, the reception accorded to the Association by the Municipality of Paris, by the Water Companies, and by the Society of Civil Engineers of France could not have been more hearty or spontaneous. Even the elements (including the treacherous Channel) favoured the party. A smooth crossing, cool breezes, showers at night or during luncheon, but never when likely to cause inconvenience, contributed largely to the comfort and enjoyment of all concerned, and enabled those intent on gaining information to devote their energies, undistracted by heat, rain, dust, or fatigue, to an intelligent appreciation of the many points of technical interest brought under their notice. In this connection, special mention must be made of the unwearying courtesy and professional sympathy with which questions were answered and information was supplied by the engineers, who, in every case, conducted the party over the various works.

The arrangements were throughout made with a view to the avoidance of fatigue. Thus, arriving in Paris at seven o'clock on Sunday evening (June 9), the first item on the programme was timed for noon on Monday; and the morning hours were left free for independent sight-seeing. Indeed, when started on brakes for the first of the official visits, the first stopping-place was the famous Restaurant de la Cascade in the Bois de Boulogne, where luncheon was served; the engineers connected with the works afterwards visited being entertained as guests of the Association. Rejoining the roomy brakes, the first visit was made to the pumping-station of the Compagnie des Eaux de la Banlieue de Paris, at Suresnes. Situated on the banks of the Seine, these works draw an average daily supply of 6,600,000 gallons from the river, and deliver it to the filtering works and service reservoirs on the heights of Mont Valérien. After a critical survey of the pumping machinery and some comments on the use of large single-cylinder instead of either compound or triple-expansion engines, also much eager inquiry as to the working results in coal or steam consumption per unit of water lifted, the drive was continued up the picturesque and tree-lined road leading to the base of the famous fort. Here, in spite of the magnificent landscape and bird's-eye view of the city, attention was speedily directed to the extensive and interesting filtering works and service reservoirs from which a population of 167,000 people is supplied with river water transformed into a condition of purity altogether beyond the range of criticism.

Having noted the light and simple construction of the reservoirs and filter-beds (*ciment-armé*, or reinforced concrete, having been adopted throughout), the whole of the party were soon absorbed studying the arrangement and working of the "Puech" filters. These have proved so satisfactory in regard to the results obtained that they are in general use, not only by the Company but by the Municipality; and they are shortly to be installed at Bamford, in connection with the important Derwent Valley water scheme now in course of construction under the supervision of Mr. Edward Sandeman, M.Inst.C.E. Full details of the system were furnished in a pamphlet translated by Mr. Easton Devonshire, Assoc.M.Inst.C.E., for the benefit of the members, which will be included in the next issue of the Association's "Transactions."

The ladies of the party were meanwhile entertained by Mme. Chaudoir, wife of the Chief Engineer of the Company, and other ladies; and the curiosity of the gentlemen having been fully gratified by M. Chaudoir and a large contingent of assistants and officials, the visit was brought to a happy and graceful conclusion by a reunion round a table well stocked with light, but welcome, refreshments. Here fitting acknowledgment was made of the hospitality and kindness of the hosts, and, as on subsequent occasions, the cordial reception of English water engineers by their French *confrères* served to forge another link in the *entente cordiale* which now so closely binds the two powerful nations in a bond of mutual sympathy.

Returning to head-quarters at the Hotel Terminus, evening dress was donned, and, refreshed with an excellent dinner, the members filed off on foot towards the handsome building owned by the Société des Ingénieurs Civils de France, in the Rue Blanche. Here the typical gracefulness of the French character was well illustrated by the presentation of bouquets of roses to the ladies of the party. Assembled in the large lecture hall, the President (M. Cornuault) took the chair, and at once proceeded to welcome the visitors in English, his address being subsequently repeated in French. A suitable and witty reply having been made by Dr. Ad. Kemna, the Vice-President of the Association—who, in the regrettable absence of the President (Mr. Sainty), undertook the official duties of his office—the company were shown the plans of the various water-works, and the world-famous system of sewers and pipe subways was also fully explained to them by M. Colmet-Daage, the Chief Engineer to the Municipality. Light refreshments having been partaken of, the party gradually dispersed, all greatly impressed with the interesting nature of the sanitary work of the French metropolis, as well as with the cordial, hearty, and graceful nature of their reception.

Tuesday morning (June 11) was devoted to a visit to the principal sewers; and, escorted by a large array of Municipal engineers and officials, the party were conveyed, partly by electrically-propelled trollies and partly by a chain of barges, through a mile of the largest sewers. These are of a considerable height and are used as pipe subways for the principal water-mains, which are supported on brackets built in the walls of the tunnel. There being a dual supply throughout the city—of spring water (*eaux de source*) and unfiltered river water (for municipal and trade supplies only) respectively, subways for the mains are here particularly desirable They are also used for telegraph and telephone cables, com pressed-air pipes, and telegram transmission tubes.

Luncheon having been taken at the Palais d'Orsay Hotel Restaurant, the ladies were released for independent visits to the Louvre Galleries and for shopping expeditions, and the gentlemen took train from the adjoining terminus for Choisy-le-Roi. Here the largest and most important of the works owned by the Compagnie Générale des Eaux were inspected, under the personal guidance of the engineering staff of the Company. The pumping machinery, though of large capacity, did not present any features of special interest beyond the use of single-cylinder engines; but the large and comprehensive installation of Anderson's revolving purifiers, with subsequent sand filtration, attracted close examination and elicited general admiration. The Company is one of the largest water companies in the world, having a capital of 40 million francs, or about £1,600,000 sterling; and the details of their works and the remarkable results obtained by means of the Anderson process in dealing with Seine water, furnished in a pamphlet, translated by Mr. Easton Devonshire, which was supplied to those taking part in the visit, and which will be included in the "Transactions" of the Association, will be of special interest to all water engineers.

The following day (Wednesday) was devoted to an excursion to the Palace of Versailles and the Grand Trianon; and it afforded a pleasant relaxation from the technical parts

of the programme. But the return journey to Paris was arranged to include the village of Marly, where, apart from a magnificent view across the valley of the Seine, the ancient aqueduct erected for the water supply of Versailles was to be seen. At La Machine a stop was made for the inspection of the remarkable battery of eight gigantic water-wheels fixed in a building spanning a wide section of the River Seine, by which spring water is forced to the town of Versailles. The history of these works goes back to the year 1685, and, as explained by the engineers in charge, proved of great interest. At the present time, electrical energy is generated alternatively by a steam turbine or by a water-turbine operated by river water, and is conveyed by cables to the source of supply two miles distant, whence the water is pumped to the works above referred to.

At the luncheon on this day, the opportunity was taken of acknowledging the services rendered by the Organizing Committee, which included Messrs. C. Sainty (President), M. Millhouse (Past-President), Dr. Ad. Kemna (Vice-President), and Mr. Easton Devonshire (Member of Council). The Secretary (Mr. Percy Griffith) was also thanked for his efforts to secure the comfort of those taking part in the trip; and a toast was also given to the ladies of the party.

On Thursday, a morning visit was paid to the enormous two-storeyed reservoir at Montsouris (capacity 45½ million gallons); and a very realistic idea of the dimensions was given by a walk through the galleries which have been constructed in the external walls for purposes of inspection and repair. Somewhat fatigued by this lengthy tour, the members were grateful for a taste of the sparking water flowing into this reservoir from the springs of the Vanne and the Loing, situated more than 100 miles away. The drive included a splendid view of the famous Arcueil aqueduct, conveying Vanne water to Montsouris reservoir. The contrast between the ancient aqueduct built in coursed masonry at a height of 59 feet above the valley, and the more modern aqueduct superposed on it, built in rough uncoursed rubble, at a height of 114 feet, was very noticeable.

After luncheon at the Hotel Terminus, the most important event of the visit (though it was not included in the programme) took place—namely, a reception by the Municipality at the Hôtel de Ville. The arrangements for this could not be definitely fixed until after the programme had been printed; but this fact did not detract in the least from the importance of a function which must be regarded as unique in the history of the Association. Assembled in the hall known as the Grand Salle des Fêtes, attention was drawn at once to the superb proportions and the magnificent decorations of the apartment. This, however, was soon diverted by the entrance of the Vice-President of the Municipal Council and specially appointed representatives of the Prefect of the Seine and the Prefect of Police respectively. Then followed complimentary speeches from all the officials present, and a suitable reply by Dr. Kemna on behalf of the Association. The party were then invited to take light refreshment, and opportunity was afforded for drinking toasts to the President of the Republic, King Edward VII., and the City of Paris respectively. The Vice-President of the Council then conducted the party through the various *salons*, including the Council Chamber and the covered court adjoining, which was in process of decoration for the visit of the King of Denmark on the following day. Work was suspended in order that the lights intermingled with the floral decorations might be switched on, and those present were thus afforded an experience as unique as it was unexpected.

The afternoon was left free of official appointments; and many members took the opportunity of inspecting the Salon, or Exhibition of Pictures in the Grand Palais in the Champs Elysées.

The programme for the last day included a drive to Montmartre, where the three storeyed reservoir built on the summit of the hill was fully inspected, and its peculiar features were thoroughly investigated and appreciated. A visit was also made to the adjoining church of the Sacred Heart; and it being a *fête* day, the decorations and the crowds attending Mass proved a great attraction, and rendered it a matter of some difficulty to secure strict adherence to the time-table. The drive was again interrupted to allow of the inspection of the pumping-station at La Villette, where some fine Corliss engines were at work, pumping Seine water from the adjoining Ourcq Canal to the Montmartre reservoir and into the public service-mains throughout the city.

Luncheon having been served at the Restaurant de la Porte Jaune in the Bois de Vincennes, the ladies were released for the afternoon, and the gentlemen were driven to the Municipal filtering-works and pumping-station at St. Maur. Here some ancient water-wheels operating force-pumps, also some vertical turbines, all worked by the River Marne, attracted special attention. But interest mainly centred in the exhibition of various filtration systems, including sterilization by ozone and the use of ferroclore for clarification and filtration. Some members of the party attended specially to inspect these plants; and they were busily engaged taking samples of the water and making inquiries into the details of working throughout the visit. Finally, a visit was made to the "Puech" filtering-works at Ivry, some particulars in regard to which, as well as those at St. Maur, were furnished in another pamphlet. After these had been inspected with undiminished enthusiasm, the members returned to head-quarters somewhat fatigued, but none the less delighted with the many interesting and useful items of information they had acquired.

In the evening, the various engineers of the works inspected were entertained at dinner at the Hotel Terminus, after which the toast-list afforded the Acting President (Dr. Kemna) an opportunity of expressing the hearty thanks of the members for their reception, and for the valuable information which had been so courteously and readily afforded throughout the visit. A pleasing function took place on this occasion, in the presentation to M. Marbontin, who had been largely responsible for the arrangements of the visit, of a silver cigarette-case subscribed by those present. The gift was handed to Mme. Marbontin by Dr. Kemna, who humorously suggested that she would no doubt control the use of it by her husband.

In view of the nature of the reception accorded to the Association on this occasion, it seems only reasonable to suggest that an early opportunity should be provided for a second visit, as by thus promoting friendship and sympathy between the water engineers of the two countries the Association would not only promote the interests of the profession generally, but would also enlarge the knowledge and experience of the members.

A pamphlet entitled "The History and Description of the Water Supply of Paris," compiled and translated from official information by Mr. Easton Devonshire, was specially prepared by him for the visit, and will be included in the "Transactions" of the Association. This and the other pamphlets referred to are noticed below.

THE HISTORY AND DESCRIPTION OF THE WATER SUPPLY OF PARIS.

As mentioned in the account given above of the recent visit to Paris of a party of members of the Association of Water Engineers, a pamphlet giving some historical and descriptive particulars of the water supply of the city was prepared by Mr. Easton Devonshire, Assoc.M.Inst.C.E. The following are some extracts from it.

Historical and Statistical.

A hundred years ago the public water supply of Paris was obtained from the following sources, which together provided daily, either by gravitation or pumping, approximately, 8000 cubic metres of water; the population of the city being then 547,700 persons.

	Cubic Metres. 1 c.m. = 220 gals.
Spring water—	
Prés Saint Gervais (northern springs)	171
Belleville (northern springs)	114
Arcueil (southern springs)	952
Seine water—	
La Samaritaine pumps	400
Notre Dame pumps	914
Chaillot "fire-pumps"	4132
Gros Caillou "fire-pumps"	1303
Total	7986

These sources supplied a certain number of public establishments, 83 public fountains, and 45 private concessionaries, either gratuitously or by payment.

The springs of Prés Saint Gervais and Belleville were brought

to the city by two small aqueducts, constructed at an early period by the monks of St. Laurent and of the Abbey of St. Martin des Champs; the first aqueduct being composed of pipes of pottery or stone, and the second of arched stone galleries provided with monumental inspection chambers, which date from 1457. The southern springs were conveyed to the city by the Arcueil aqueduct, inaugurated in 1624 by Louis XIII.; the first stone having been laid in 1613 by Marie de Médici. The pumps of "La Samaritaine" were erected under the second arch of the Pont Neuf, near the Louvre, in the reign of Henry IV. (1600) by Jean Lintlaer, a Flemish engineer, for the supply of the Louvre and Tuileries. They consisted of a suspended water-wheel driven by the flow of the river, and actuating pumps raising at that time 710 cubic metres of water daily to a reservoir constructed in the cloister of Saint-German l'Auxerrois. The pumps of Notre Dame, erected on the same plan in 1669 by Jolly and Demanu, raised as much as 1600 cubic metres per day. The "fire-pump" erected in 1781 at Chaillot, a village below Paris, consisted of two steam-engines of 69 H.P. each, of the Newcomen type, with wooden beams; and they raised the river water into four reservoirs built near together in the neighbourhood. The "fire-pump" of Gros Caillou, built shortly afterwards on the opposite bank of the Seine, comprised two steam-engines of 14 H.P., and pumped into a water-tower.

In 1802, during the Consulate of Napoleon, the Legislature decreed the construction of a "canal of derivation" of the waters of the River Ourcq, by which the whole volume of the river—an effluent of the Marne, was diverted at Mareuil at a distance of 97 kilometres to the north-east of Paris into the Canal de l'Ourcq, which terminates at the Bassin de la Villette, whence it was distributed through the city by an underground gallery, known as the "Aqueduc de Ceinture" and by a system of conduits. In 1813 the Canal de l'Ourcq was opened for navigation. But the works in connection with it were suspended in 1814 at the fall of the First Empire; and it was only during the first years of the Restoration that their completion, together with the construction of the Canal of Saint Denis, which also terminates at the Bassin de la Villette, was entrusted to the Company Vassal and St. Didien, to whom was granted a concession for 90 years to date from Jan. 1, 1823. This Company further undertook the construction of a third canal—viz., that of St. Martin. The concession to the Company was put an end to by the purchase by the City of Paris of the St. Martin Canal in 1861 and of the Ourcq and St. Denis Canals in 1875. To reach the higher levels of the old city, a large iron tank supported on a masonry tower, and known as the "Cuve de Chaillot" was erected during this period above the village of Chaillot.

A feature of the supply at the beginning of the Nineteenth Century was the sale of water by water carriers, who hawked water obtained from public tanks known as "*fontaines marchandes*," paying the City for it at the rate of 90 c. per cubic metre. This trade dated from 1786, and grew to considerable importance, especially after 1819, when a decree issued by the Prefect of Police forbade the filling of water-carts from public drinking fountains. The water sold, however, was far from good, and in 1821 experiments in filtration were made at the "*fontaine marchande*" of Boule Rouge. The filtering material was broken stone, charcoal, and fine sand, and was the forerunner of various types of filters, of which a small one of porous stone became largely used by private consumers. A company was eventually formed for the sale of filtered water and erected a plant at the Quai des Célestins, on what was known as the Vedel and Bernard system; the water being conveyed to the inhabitants in large carts.

The sinking in 1832 of an artesian well at Grenelle and additions to water pumped from the Seine increased the supply, so that in the year 1854 it amounted to 80,400 cubic metres, from the following sources: Ourcq Canal, 60,000; Seine water, 19,000; Arcueil water, 300; Grenelle well, 900; northern springs, 200.

In 1854 an entirely new programme was decided upon, and in 1856 Belgrand initiated the system of a dual supply, which is in use at the present time. In conformity with his plans, two entirely distinct supplies were created—the one for public uses, trade purposes, courtyards, stables, and gardens, and the other for domestic uses only. Two systems of mains were established—the first for the public and the second for the private service. The existing sources of supply from the Ourcq Canal and the Seine, as well as the hard waters of the northern springs, were reserved for the public service; while a new supply from distant springs was sought for and eventually brought into Paris in covered aqueducts. At the same time the city was divided into zones, whose varying levels could be reached by gravitation, or, where necessary, by pumping to reservoirs. For the private service Belgrand brought into Paris the spring water of the Vanne on the south and that of the Dhuis on the north-east; while additional water for the public service was obtained from pumping-stations at Austerlitz on the Seine and Saint Maur on the Marne.

On the death of Belgrand, in 1878, the supply of Paris was as follows: River water (Ourcq, Seine, and Marne) 241,000 cubic metres; spring water (Arcueil and artesian wells, Dhuis, and Vanne) 129,000 cubic metres—total 370,000 cubic metres. The programme initiated by Belgrand was continued and extended, under the administration of Alphand, as Director-General of Public Works, by MM. Couche and Humblot, successively Engineers-in-Chief of the water and drainage service. Under the administration of M. Humblot and of M. Bechmann, the Chief Engineer of the Water and Drainage Department, the Avre project was complete in 1893, adding 100,000 cubic metres daily to the private service; and 50,000 cubic metres more were added in the last years of the past century from the springs of Loing and Lunain. A supplementary supply of 70,000 cubic metres of filtered water from the Seine and the Marne was further secured by the construction of filter-beds at St. Maur in 1897 and at Ivry in 1899. In connection with these additional supplies, reservoirs were built at Passy, Charonne, and Montretout, and further pumping machinery erected at St. Maur, Ivry, and Place St. Pierre.

As the result of the great works undertaken during the last half of the Nineteenth Century, the supply of Paris in 1900 was as follows:—

Private Service.

Spring water of the Dhuis	20,000	cubic metres.
" " " Vanne	120,000	" "
" " " Avre	100,000	" "
" " " Loing and Lunain	50,000	" "
Total	290,000	cubic metres.
Filtered river water	70,000	" "

In dry weather the delivery of the springs falls as low as 210,000 cubic metres; so that the whole private service supply ranges between 370,000 and 270,000 cubic metres daily, or from 135 down to 104 litres per head of the population.

Public Service and Trade Supply.

Ourcq Canal	150,000	cubic metres.
Seine water	260,000	" "
Marne water	120,000	" "
Artesian wells and old aqueducts	7,000	" "
Total	537,000	cubic metres.

The united supplies amounted to 790,000 to 870,000 cubic metres, or from 304 to 355 litres per head.

The consumption of water during 1906 was as follows:—

Private Service.

Spring water, average per day	262,670	cubic metres.

Public Service and Trade Supply.

Ourcq water, average per day	122,840	cubic metres.
Seine water " " "	252,140	" "
Marne water " " "	81,650	" "
Artesian wells " " "	6,090	" "
Total	462,720	

The total water supply for all purposes during the year was 264,766,500 cubic metres, with a daily average of 725,390 cubic metres (159,585,800 gallons), for a population of 2,722,731 persons, according to the census taken in 1905, which is equivalent to 266·4 litres, or 59 gallons, per head per day.

The period of transformation of the system of water supply in accordance with Belgrand's scheme coincided with the enlargement of the municipal boundaries, so as to include the whole territory within the line of fortifications—absorbing the intramural communes which previous to 1859 had been separately administered. These communes, as well as others outside the ramparts, were supplied by the Compagnie Générale des Eaux under the terms of various concessions. The transfer to the city was complicated by the fact that the charges for water made by the Company were considerably higher than those imposed by the Municipality; the annual rate per cubic metre of daily supply being 50 frs. for Ourcq water and 100 frs. for Seine water in the city, compared with 180 frs. in the communes, which were supplied by the Company with water drawn from the Seine below Paris.

An arrangement was effected in 1860 by which the Company handed over to the Municipality their pumping-stations at Port-à-l'Anglais, Maisons Alfort, Auteuil, Neuilly, Clichy, Saint Ouen, and Charonne, together with their corresponding reservoirs, 259,000 metres of mains, the "*fontaines marchandes*," and the whole of its plant within the Department of the Seine, and transferred to the city all its rights under the concessions it enjoyed. As consideration for this transfer of their property, the Company were granted a concession for fifty years, under the terms of which they became lessees of the Municipality, and undertook the commercial exploitation of the supply, including the making of agreements with consumers, the sale of water, the laying and maintenance of connections to mains, and the collection of rates. The City agreed to pay the Company an annuity of 1,160,000 frs. (representing the amount of the Company's net profits at the time), an allowance of 350,000 frs. per annum to cover the cost of "farming" the receipts, and one-fourth of the profits in excess of 3,600,000 frs. The charge for Ourcq water was fixed at 60 frs. per cubic metre of daily supply, and that for Seine water at 120 frs. The contract of 1860 was, however, altered by mutual consent in 1867. Subsequent contracts, made in 1869 and 1880, modified the previous agreements, notably as regards the charges for water; and in 1894 new regulations were made as to the supply of spring water. This dual system of administration, which leaves the Municipal authority the ownership and maintenance of the sources and works of supply, while the Company are responsible for everything relating to the sale of water to private consumers, has worked satisfactorily, and is still in operation.

The Pumping Stations and Wells.

After giving, by the aid of a map and diagrams, a description of the springs and aqueducts connected with the private service supply of the city—viz., the spring of the Dhuis, the Vanne, the

Loing and Lunain, the Avre, and filtered river water—Mr. Devonshire proceeds to deal with the public service supply, which is obtained mainly from the Ourcq Canal, the Seine, and the Marne. The river water is pumped from intakes at the pumping-stations of Ivry, Austerlitz, Bercy, Chaillot (Auteuil), and Javel on the Seine, and Saint Maur on the Marne. The most important of these stations are at Ivry and Saint Maur, the former supplying 200,000 cubic metres of unfiltered river water to reservoirs at Villejuif and Charonne, and the latter 110,000 cubic metres to the lower compartment of the Mènilmontant reservoir, both works also pumping filtered water into the private service mains when required.

The Ivry pumping-station consists of the old and new works; the latter being 250 metres higher up the Seine than the former. The old works, as constructed in 1881-3, contained six engines of 150 H.P., capable of raising 85,000 cubic metres of water per day. Three more engines of 170 H.P., to pump 50,000 cubic metres, were added in 1899. In these new works, the machinery consists o eight engines of 200 H.P. each, of which four are reserved for pumping filtered water from the plant erected at the works. The water pumped by the Ivry stations is conveyed partly to the Villejuif reservoir by two mains, 1·10 metres and 0·80 metre diameter respectively and 4300 metres long, laid in the ground for the most part, but passing through masonry culverts in the populated district of Ivry, and partly to the Charonne reservoir by two mains laid in a trench.

The pumping-station of Saint Maur is situated at Joinville-le-Pont, on the navigation canal which cuts through the isthmus at the bend of the river, and occupies the site of the ancient mills of Saint Maur, which were purchased by the City in 1863. The station comprises four distinct works, of which two utilize the water from the old mills, with a fall increased to 4·10 metres, and two provide steam power for pumping filtered water and unfiltered water respectively. The aggregate pumping capacity of the works is 23,000 cubic metres of filtered and 110,000 cubic metres of unfiltered water per 24 hours, of which 12,000 cubic metres supply the Gravelle Lake at an altitude of 72 metres, and the remainder is raised to the lower compartment of the Mènilmontant reservoir at the level of 100 metres above datum. There are five rising mains, of which one, 50 cm. in diameter, supplies the Gravelle Lake; one, 60 cm. and two 80 cm. in diameter, reach the Mènilmontant reservoir by different routes, of a total length of 11 kilometres; and the fifth, 1·10 metres in diameter and 6300 metres long, conveys filtered water only to the Place Daumesril, where it connects with the distributing mains of the spring water supply. The filtering plant comprises six filter-beds with decanting tanks. The works at the Austerlitz pumping-station, constructed on the Quai d'Austerlitz in 1863 and enlarged in 1898, originally contained two vertical beam engines of the Woolf type, with vertical double-acting pumps; each engine being of 110 H.P. The new engines, two in number, each of 180 H.P., are of the horizontal Corliss pattern, with Girard pumps, and are supplied by four semi-tubular boilers. They pump into three cast-iron mains, of which two, 50 cm. in diameter, laid when the works were built, supply the Gentilly reservoir in one direction and the Charonne reservoir in the other, at the level of 82 metres above datum in both cases. The third main, laid in 1897, connects with one of the supply-mains of the Villejuif reservoir at the level of 89 metres, and also supplies a tank near the Gentilly reservoir. The total volume of water pumped from this station is 56,000 cubic metres per 24 hours.

The Bercy pumping-station was built in 1889, the Auteuil station in 1832, and the Javel station in 1887. In addition, there are four relay stations—viz., the Ourcq, the Mènilmontant, the St. Pierre, and the Charonne.

Artesian wells contribute very little to the water supply of Paris, although acquiring considerable celebrity at the time of their first construction. The oldest of these wells, sunk at Grenelle, was commenced in 1833, but was not completed until 19 years later. The boring reaches the greensand formation underlying the cretaceous stratum at a depth of 500 metres; the water rising to a height of 38 metres above the ground to the summit of the cast-iron column erected on the Place de Breteuil. Its original flow of 950 cubic metres per 24 hours fell suddenly to 600 cubic metres on the completion of the Passy well, and now amounts to 400 cubic metres only. The water is limpid and soft; but its temperature is high, and it is mixed with the river water for the public service. The Passy well, sunk at the Place Lamartine, where the water rises to the level of some 53 metres above datum, delivers a much larger volume—nearly 5000 cubic metres—similar in character to that of the Grenelle boring, but containing some sulphur. It is used for the supply of the lakes in the Bois de Boulogne. The boring was undertaken in 1855 by M. Kind, at the contract price of 350,000 frs., but was abandoned by the contractor two years later owing to a serious accident, and was finished by the City in 1861. Its diameter is 1·10 metres at top, reduced to 70 cm. when it enters the greensand at a depth of 586·5 metres; and it is lined with oak tubbing, strengthened with iron hoops and vertical rods. Two other wells—one at the Place Hébert and the other at the Butte aux Cailles—have since been sunk; the first, commenced in 1884 and finished in 1891, reaching a depth of 718 metres, and supplying 2000 cubic metres of water to a public swimming bath, and the second was in course of completion in 1900, when it had reached a depth of 566 metres.

The Reservoirs.

Paris is divided into two principal zones. Of these, the central or low-level one extends in approximately equal areas on both sides of the Seine, and may roughly be said to take its supply for public service from the Ourcq on the ground-floor level, and for private service from the Vanne and the Loing on the upper floors of the houses. In a similar manner the outer or high-level zone is supplied by unfiltered river water from the Seine and Marne for low-pressure, and with Avre and Dhuis spring water for high-pressure requirements. Isolated districts on the heights of Montmartre and Belleville to the north, and a small district in the neighbourhood of the Montsouris reservoir to the south, may be grouped together as forming a third zone, which is reached by the aid of the relay pumping-stations already referred to. The reservoirs corresponding to this broad division of the zones of distribution have their overflows at levels ranging from 52 metres down to 47 metres above datum for the Ourcq supply, and from 79·50 to 75·50 metres for that ofthe Vanne and the Loing in the central zone; from 89 to 65 metres for Seine water, and from 108 to 107 metres for Avre and Dhuis water in the outer zone, in the supply of which Marne water from the Mènilmontant reservoir at the level of 100 metres also participates; and from 131 to 97 metres for river water and 136 to 134 metres for spring water in the isolated districts of the northern and southern heights.

The Mènilmontant reservoir is the oldest and the largest of the reservoirs holding different waters in separate compartments; and it was built by Belgrand in 1865 on the high ground on the north-east of the City territory. It consists in effect of two reservoirs, one above the other, the upper being in the form of a half circle with a radius of 95·40 metres, completed by a rectangle measuring 190·80 metres by 44·80 metres, and the lower approximately a square with sides 100 metres long. The upper division receives the flow of the Dhuis aqueduct, and has a storage capacity of 100,000 cubic metres (22 million gallons), with a depth of 5 metres of water; its overflow being at the level of 108 metres above datum. The lower division receives the unfiltered water pumped from the Marne at Saint Maur, and holds 28,000 cubic metres (6,160,000 gallons), with a depth of 4 metres of water; its overflow level being 100·20 metres.

The Montsouris reservoir, situated on the southern boundary of the City, was built under Belgrand at the same period as the Vanne aqueduct (1871-1874), by which it is supplied; the Loing aqueduct being connected to it in 1899. It is built in the form of a rectangle, 265 metres long and 136 metres wide, and consists of two divisions, one above the other. The upper portion, divided by a cross wall into two square compartments, has a capacity of 80,000 cubic metres (17,600,000 gallons), with a depth of water of 3 metres, and an overflow level of 80 metres above datum. The lower portion is also in two compartments, holding 126,400 cubic metres (27,800,000 gallons); the full depth of water being 5·50 metres, and the overflow level 73·75 metres—these compartments being filled from the upper portion of the reservoir, either from the overflows or by pipes connecting the two divisions. The construction is entirely of stone-grit masonry in cement mortar, except for the arches, which are formed of very light bricks of a type adopted by Belgrand, and subsequently employed in most of the Paris reservoirs; the arches being carried on brick columns and abutments.

The Saint Cloud reservoir, which is situated on the heights of Montretout at the outlet of the Avre aqueduct, contains three compartments on the same level, of which two were completed in 1894, and the third in 1900. The reservoir has a total capacity of 300,000 cubic metres (66 million gallons); and with buildings it covers an area of over 83,000 square metres (21 acres). It is in the form of a rectangle, 418 metres long by 352 metres wide, divided by cross walls; its depth of water when full being 5 metres, and its overflow level 107 metres above datum. The aqueduct discharges into a tank placed at the western end of the wall dividing the first two compartments, where it is covered by a light structure of iron and glass. The reservoir floor, walls, and roof supports are constructed of stone-grit masonry in portland cement mortar, with a cement rendering over the whole of the inside surface. The arches are composed of two courses of light bricks, 3 cm. thick, laid in portland cement. The roof of each compartment is divided into twelve squares of straight and groined arches combined, all having a span of 5 metres and a rise of 60 cm., and springing from square columns 50 cm. by 0·50 cm. The floor is 0·35 cm. thick, with a slight fall towards the delivery and waste outlets.

The Villejuif reservoir, which receives unfiltered Seine water pumped from Ivry, was designed to hold 50,000 cubic metres in four compartments, of which two were built in 1881-3. It stands on the side of a hill to the south of Paris, near the village of Villejuif, and, owing to the unstable nature of the soil, required special precautions in making its foundations. The floor is double, and formed of galleries of elliptical section, which serve as drains and also carry all the pipe connections. It is roofed over with light brick arches, and covered with a layer of earth, with long abutments separated from the outer walls by a space to avoid excessive thrust. The depth of water in this reservoir is 5 metres, and its overflow level 89 metres above datum.

The Montmartre reservoir is an architectural structure, 18 metres high, ornamented with stone balustrades and turrets. It holds 11,000 cubic metres of water, divided among three superposed compartments forming three floors, which are in turn supported on a foundation of arched galleries; the substructure serving both as a protection against leakage water and a space for lodging the various pipes supplying the different levels. The

lower storey receives river water in two compartments, with a depth of 5 metres and an overflow level of 127·30 metres above datum. The second storey, which entirely covers the one below, has a depth of 3·50 metres of spring water, is also in two compartments, and has an overflow at the level of 132 metres. The fifth compartment on the top storey only partly covers the floors below; it also receives spring water with an overflow level of 136 metres—both spring and river supplies being pumped from the station in the Place Saint Pierre. The somewhat perilous situation of this reservoir—on a sandy soil, 80 metres above the surrounding streets—necessitated extremely strong construction. Its foundation consists of a double bed of concrete with an intermediate rendering of portland cement; and the masonry of its walls is strengthened by bands of iron at each floor.

The larger Passy reservoir, as distinguished from the older reservoir purchased from the Compagnie Générale des Eaux, in 1860, and since disused, is situated at the Place du Trocadéro, and consists of six compartments, of which five receive river water and the sixth spring water from the Avre aqueducts. Four of the compartments are in pairs, superposed; one of the two upper compartments being covered for the storage of 6000 cubic metres of spring water, the others, together with a fifth compartment at the lower level, holding 29,000 cubic metres of river water. The overflow level of all the upper compartments is 75·33 metres. These five compartments were constructed in 1858. A sixth compartment, built in 1899 on the lower level, has a capacity of 22,000 cubic metres and a depth of 5 metres. It is uncovered, as are also the fifth compartment and the upper compartment for river water.

The Charonne reservoirs are two in number, separated by the Rue des Prairies, to the east of Paris. The older reservoir, of a capacity of 5600 cubic metres at a level of 80·70 metres, is connected to the reservoir built in 1899, and containing 23,500 cubic metres, with an overflow level of 82 metres. These reservoirs, which can be used either together or separately, store Seine water pumped from the Ivry and Austerlitz works, and can also be supplied from the Bercy pumping-station, or from the Marne by a connection to the Saint Maur mains.

The Gentilly reservoir is situated to the south of the city, at a short distance outside the Porte d'Arcueil. Its level is 82·10 metres above datum, and it is divided into two compartments, holding 10,300 cubic metres, constructed respectively in 1865 and 1882. It is supplied from a tank of 200 cubic metres capacity, erected in 1898 in proximity to it at the overflow level of 88·50 metres, with water pumped by the Austerlitz station with a connection to the mains from the Villejuif reservoir. The Gentilly reservoir feeds the low-level reservoirs of Grenelle and the Panthéon. Of the last-named reservoirs, that of Grenelle, situated in the south-west of the city, is an open construction in two compartments, with a capacity of 6500 cubic metres. The Panthéon reservoir, to the south of this district (the supply of which it also supplements), is a small construction of two compartments with an overflow level of 65 metres above datum.

The gravitation supply to the low-level district may be said to have four reservoirs—that formed by the Bassin de la Villette, at the termination of the canal, being one. The three others, which serve as equalizing or compensation reservoirs, from the termini of the three conduits which run from the Aqueduc de Ceinture, on the north, to three points on the southern limit of the low-level zone. The highest of these reservoirs is the Saint Victor, constructed in 1846, and holding 7000 cubic metres of water, with a depth of 5 metres and an overflow level of 48·40 metres above datum. The second, known as the Vaugirard, built in 1840, is practically at the same level, and holds 8930 cubic metres in two compartments, 4·70 metres deep. The third, built four years earlier, is the Racine reservoir, divided into three compartments with a top-water level of 46·80 metres. The Ourcq water supplying these reservoirs flows from the Bassin de la Villette at the level of 52 metres.

This enumeration of the reservoirs of Paris may be completed by the mention of the relay reservoir of Buttes Chaumont, which receives Ourcq water pumped from the Ourcq station, in two compartments of 8800 metres capacity at the altitude of 97 metres; the Saint Pierre tank, erected on a water-tower in 1888 at the level of 83·56 metres, and feeding the Passy and Charonne reservoirs with Seine water pumped at Bercy; and, lastly, the Belleville reservoir, constructed in 1863, on the high ground to the north-east known as the Butte du Télégraphe, and holding in two superposed compartments, of a total capacity of 18,000 cubic metres, spring and river water raised by the engines of the Mènilmontant relay station—the spring water reaching a level of 134·40 metres, and the river water overflowing at a height of 131·10 metres above datum.

Distributing Mains and Appliances.

The total length of mains of all sizes and materials is little short of 2500 kilometres (1560 miles). Their diameters range from 27 to 135 mm. in lead pipes; and from 41 mm. to 1·10 metres in cast-iron, with 1338 metres of a diameter of 1·30 metres in armoured concrete, and 3564 metres, 1·15 metres in diameter, of steel pipes. As a general rule, all pipes, both large and small, are laid in the sewers or in dry subways built over them. It is claimed that the facility of inspection and the detection and repair of leaks afforded by this system, adopted generally by Paris alone among the cities of the world, outweighs the increased cost involved in the first instance. The cast-iron pipes employed are of special form, being made with two plain ends without socket, flange, or bead. The lengths of pipe are placed end to end with a space of a few millimetres between them; this space being closed by a covering fillet of clay. Short double sockets cast with a slight taper are slipped over the joint, and held in position by wedges; while lead is run in from both ends, and set up on both faces. In case of a length of pipe having to be renewed, the taper of the collar allows it to be knocked off the joint with a few blows of a hammer, and the lead is cut off cold. The pipes are generally carried on cast-iron brackets let into the side walls of the sewer; the larger mains being laid on masonry blocks or small cast-iron columns placed on the set-offs provided for the purpose in the larger subways, or supported on joists fixed from wall to wall. For the control of all mains of 10 c. (4 inches) diameter or less, plug cocks are used; the pattern adopted for some years past being that known as the "Gibault" cock, which is made of gun metal, the conical plug having its big end downwards. For larger diameters, sluice-cocks of the usual type are employed, with full-way for all sizes of mains up to 0·90 cm., 100 cm., and 110 cm., for which sluice-cocks having an opening of only 80 cm. diameter are generally used as being lighter.

All drinking fountains, wall fountains, and stand-posts for drinking purposes are supplied with spring water. The fire hydrants—7000 in number, and placed 100 metres apart—are also served from the spring-water mains, which alone provide the requisite pressure. For washing the streets and the boulevards, Ourcq and river water is supplied to 7800 hydrants placed in the gutters. The street-watering hydrants, 7000 in number, have outlet orifices 4 cm. in diameter, to which are coupled jointed pipes on roller wheels, which run on the surface of the street in any direction at the will of the man directing the short length of hose and nozzle attached to them. For filling water-carts, fixed pipes rising above the ground to the requisite height, and known as "swan-necks" from their shape, are screwed on to the watering hydrants at convenient centres. Ornamental fountains are very numerous in Paris, especially in the low-level zone, where they are supplied by gravitation from the Ourcq Canal, and run daily, whereas those in the higher districts, supplied with water pumped from the Seine or Marne, reserve their displays for Sundays and holidays.

The pamphlet closes with some remarks on the conditions of supply to private consumers, and on the financial results of the water undertaking in the year 1900—the date of the official publication prepared for the International Exhibition by M. Bechmann (then the Chief of the Technical Service of Water and Sewerage), from which, as well as from that gentleman's successor, M. Colmet-Daage, Mr. Devonshire obtained his information.

PARIS WATER-WORKS AND FILTRATION PLANT.

In connection with the historical and descriptive particulars of the water supply of Paris which is given above, it will be of interest to publish an account of the two Companies who are largely responsible for maintaining the supply, as well as of the plant which they and the Municipality have installed for rendering it as pure as possible. This we are able to do from one of the very interesting pamphlets by Mr. Easton Devonshire, Assoc.M.Inst.C.E., issued to the members of the Association of Water Engineers on the occasion of their recent visit to Paris.

The Water-Works.

In the course of the historical particulars above alluded to, the arrangement come to between the Municipality and the Compagnie Générale des Eaux, for the transfer of their works to the City, and for the "farming" of the supply by the Company, was briefly mentioned. The Company was formed in 1853, with a capital of 20,000.000 frs. (£800,000), which was increased to 40,000,000 frs. (£1,600,000) in 1881. The suburban districts supplied by the Company extend almost round Paris, and now comprise 131 communes in the Departments of the Seine, Seine-et-Oise, and Seine-et-Marne, with a population of about 900,000 inhabitants. In addition to owning and administering the water supply to this large territory, the Company are responsible, as stated elsewhere, for the commercial management of the water supply of the City of Paris, with its 2,750,000 inhabitants, collecting water-rentals from consumers, laying connections, and fixing meters, under its contracts with the Municipality.

At Choisy-le-Roi there are four engines of the Farcot type, each capable of raising 17,000 cubic metres of water per 24 hours, and four Corliss engines built by the Fives-Lille Company, each pumping 11,000 cubic metres per day. At Neuilly-sur-Marne there are also eight engines, of which two of the Farcot type deliver 17,000 cubic metres each; four Corliss engines, constructed at Fives-Lille, each of 11,000 cubic metres; and two Worthington pumping-engines, of 12,000 cubic metres each. In addition to these, the Neuilly-sur-Marne works are provided with a Laval turbine capable of raising 70,000 cubic metres of water daily to the filter-beds.

The pumps are of the "Girard" type; each engine actuating a single-acting pump for the low lift to the revolving purifiers and filter-beds, and a double-acting pump for raising the filtered water

to the reservoirs. This method of combining the low and high lift pumps with each set of engines ensures the pumping of the water in relation to the quantity filtered.

The pumping-stations at Boulogne-sur-Seine, Neuilly-sur-Seine, Saint Denis, and Epinay, situated below Paris, have been abandoned as sources of supply of potable water. The supplying stations are grouped in two principal centres—on the Seine at Choisy-le-Roi, and on the Marne at Neuilly-sur-Marne, with a third smaller station at Nogent-sur-Marne. Some idea of the size of these three stations, and of their rapid development, is given by the following table, which shows the relative figures of the horse power of the pumping machinery, and the area and delivery of the filter beds:—

Date.	Horse Power.	Filter Area. Sq. Met.	Delivery. Cub. Met.
Jan. 1, 1896	1100	19,375	70,000
July 1, 1900	2250	39,250	130,000
Jan. 1, 1907	3450	48,500	195,000

The water from the Seine and the Marne, purified and filtered, is pumped into two large reservoirs placed 122 metres above sea level—one at Montreuil to the north-east, and the other at Villejuif to the south of Paris, forming the heads of the trunk mains. Two reservoirs have been built at a lower level on the western and northern boundaries of the Company's district at Puteaux and Pierrefitte, receiving the overflow from the mains, and furnishing a reserve in case of great draught. All these reservoirs are connected to the pumping-stations by an unbroken ring of mains of 500 mm. (20 inches) to 800 mm. (32 inches) diameter, allowing the stations to mutually support each other. Less important reservoirs of either masonry, reinforced concrete, or iron, situated on the heights of Fontenay, Robinson, Chatillon, Les Lilas, Avron, and Champigny, are supplied from pumping-stations providing first or second relays, and permit of reaching the highest points in the Department. The length of mains of large diameter for high lift and supply exceeds 1300 kilometres (810 miles); while the general network of mains amounts to 2300 kilometres (1437 miles).

We now come to the works of the Company supplying the suburbs—the Compagnie des Eaux de la Banlieue. In 1864, the communes of Suresnes, Nanterre, Rueil, Asnières, Gennevilliers, and Colombes granted a concession for the supply of water for domestic, industrial, and agricultural uses to M. Adrien Dumont; while a similar concession was placed with M. Léopold de la Vallée-Poussin, Director of the Compagnie Générale des Conduites d'Eau, of Liège, for the supply of the commune of Courbevoie. These two concessions were transferred in 1867 to the Suburban Water Company, whose original capital of 2,000,000 frs. was increased in 1883 to 2,500,000 frs. At that time the population of the suburbs included in the communes was 36,000; but it has grown to 167,000 at the present time. The district supplied is nearly 23 square miles in area, and, with the exclusion of Puteaux, is practically coterminous with the territory lying within the loop formed by the Seine to the north-west of Paris. The length of mains has increased from 42 kilometres (30 miles) in 1867 to 350 kilometres (220 miles) in 1907. The concession fixed at 60 years for several of the communes has since been prolonged, expiring for Asnières, Colombes, and Bois-Colombes in 1925, and for Courbevoie in 1929. The number of consumers separately supplied is now 17,136; and the aggregate value of the water-rentals 872,597 frs. The average daily consumption approximates 30,000 cubic metres (6,600,000 gallons), with a maximum of 35,000 cubic metres (7,700,000 gallons).

The water is drawn from the Seine immediately above the "barrage" at Suresnes, and reaches the pump-sumps by a culvert 140 metres in length. There are four groups of engines and pumps. The boilers are six in number—two (of the Galloway type) with a heating surface of 125 square metres (1250 square feet); and four, with superheaters, of 100 square metres (1000 square feet) heating surface. There are three rising mains from the pumps to the reservoirs, of the diameters of 600 mm., 500 mm., and 250 mm. (24 inches, 20 inches, and 10 inches) respectively. The four groups of machines are capable of lifting 70,000 cubic metres of water daily.

Before the installation of the filtering plant, which will be described later, the district was supplied from two principal distributing reservoirs, of which one is situated on the heights of Mont Valérien, at the level of 91·94 metres above datum, supplying the communes of Suresnes and Rueil; and the second at the Rond Point des Bergères, at an altitude of 71·50 metres, supplying Nanterre, Courbevoie, Asnières, and Gennevilliers. There are in addition seven secondary reservoirs, of similar construction to the last, placed at various points and levels in the district; the total storage capacity of these reservoirs being about 20,800 cubic metres. In connection with the construction of the filtering installation on Mont Valérien, a new reservoir has been built to hold a further 19,000 cubic metres.

The mains now measure 350 kilometres (220 miles), and are of diameters varying from 800 mm. to 40 mm., controlled by 1300 sluice-cocks. The supply for public uses is provided by 630 hydrants for fire, street-watering, and sewer-flushing purposes, 60 hydrants for fire purposes only, 48 connections for flushing sewers, 8 monumental fountains, 69 stand-posts, and 10 urinals.

The Purification and Filtration Plant.

In July, 1894, the Compagnie Générale des Eaux were invited by the Prefect of the Seine to study the measures to be taken to improve the quality of the water supply of the Paris suburbs. Experiments had been made from 1890 to 1892 at Boulogne-sur-Seine with a plant for 500 cubic metres per day, and subsequently with an installation for 5000 cubic metres. After the results obtained had been verified by the Laboratory of Montsouris, the Company, on Jan. 20, 1894, entered into an agreement with the Department of the Seine by which they undertook (1) to utilize the lower water for hygienic and trade purposes only, (2) to draw from above the city the whole of the water intended for the potable supply, and (3) to purify this water by treatment with metallic iron followed by filtration through sand. The works comprised in this programme, which involved a total outlay of 12,000,000 frs., were completed Jan. 1, 1896, and gave the results expected from them.

The method of treatment employed consists of slow filtration through sand filters of fairly shallow depth (about 65 cm.), scientifically constructed and bacteriologically controlled; the water being previously charged with a coagulant. This coagulant is formed by the action of the water on metallic iron. The insoluble organic salts thus produced are not of a dangerous character for the purposes of supply, and moreover filtration completely removes them from the water. The river waters of the Paris basin having a sufficient degree of hardness, the iron employed as the coagulant gives excellent results, and allows of subsequent filtration at the rate of 4 cubic metres per square metre per 24 hours (88 gallons per square foot); that is to say, with half the filter surface required for filtration by sand only.

The water drawn from the Seine is stirred with metallic iron in rotating cylinders termed "revolvers." On leaving these, the water flows over cascades, the object of which is to peroxidize the salts of iron formed, into decanting reservoirs, where it gets rid of the greater part of the solid matter in suspension; being conveyed thence to the sand filters, and from them through conduits to the sumps of the high-lift pumps, which raise it to the reservoirs. The duration of contact between water and iron in the revolver is about 3½ minutes, and its sojourn in the decanting tanks three hours, during which it traverses a distance of about 300 metres through narrow channels. The filtering layers are 65 cm. thick, with a head of 90 cm. of water over them on the average. The filters act at the surface, and the materials which compose them—bricks, pebbles, gravel, sand, or porous slabs and sand—are in reality only the support of the surface layer, which alone appears really efficacious by reason of the "felting" which constitutes it.

Although the quantity of iron dissolved is small (2½ to 3 grammes per cubic metre), coagulable salts are formed, the influence of which is manifested in the following manner: (1) The diminution in the dissolved organic matter from the moment the water leaves the "revolvers." (2) A coagulation of the "colloidal" alumina by the "colloidal" salts of iron. (3) The production of a "felting" formed in great part by these colloidal salts of iron in the upper layers of the filters, but sufficient nevertheless to prevent the penetration of the fine clay silt, and consequently the blocking of the lower layers. (4) The progressive formation of a deposit composed of clay silt, salts of iron, and the *débris* of living organisms or micro-organisms, constituting the really active layer of which the underlying layers are only the support.

The working of a filter is constantly followed. The attendant knows at each moment the state of each filter, its delivery, loss of head, and the number of turns or fractions of turns of the valve which controls the filtered water conduits. Daily charts of these observations are drawn up for the central office, where they are combined with the charts of the running of the engines and with indications of level in the collecting sumps, so that constant control is exercised. These measures of control allow of obtaining, in spite of the daily stopping of engines or filters, a practically constant level in the collecting sumps, though the water comes from 30 different filters at Neuilly and 34 at Choisy-le-Roi.

Every week, at varying and unexpected dates, the officials at the Laboratory of Montsouris take samples not only from an isolated filter, but also from the pumping main, and make bacteriological analyses; the samples thus collected representing the average quality of the water supplied by the installation. From a sanitary point of view, the results obtained are excellent, the cases of typhoid fever per 200,000 inhabitants having notably diminished in the suburbs, as shown by the following figures:—

	1904.	1905.	1906.
Compagnie Générale des Eaux	159	135	151
City of Paris	201	157	183
Compagnie de la Banlieue	347	230	213

Turning to the purifying arrangements of the last-named Company, we learn from the pamphlet that after a prolonged study of the best systems of filtration in Europe and America, the Company erected on the high ground surrounding their reservoir at Mont Valérien plant consisting of Puech gravel strainers, pre-filters, and finishing filters. This plant, which has a filtering capacity of 35,000 cubic metres (7,700,000 gallons) of water daily, consists of a series of Puech strainers, or "*dégrossisseurs*," which receive the river water from a small distributing basin at the head of the rising main. The strainers consist of beds of Seine gravel of graduated coarseness and of successively increasing surface contained in groups of four basins at falling levels, with provision for the aëration of the water flowing from each strainer to the one next below it. Each strainer of the series is in four compartments, which can be independently cleaned. The first

set of strainers has a total surface of 146 square metres, with a depth of 30 cm. of pebbles measuring 20 mm. to 30 mm. on the sieve; the second set a surface of 246 square metres, with 35 cm. of pebbles of 10 mm. to 15 mm.; the third a surface of 447 square metres, with 40 cm. of pebbles of 7 mm. to 10 mm.; and the fourth a surface of 741 square metres, with 40 cm. of pebbles of 4 mm. to 7 mm. The water passes through the strainers at a high speed; the rate decreasing from approximately 180 cubic metres per square metre of surface per 24 hours in the first set to 35 cubic metres in the fourth set—allowing for one-third of the total area to be laid off for cleaning. The gravel is washed by being turned over by hand under a stream of river water; the muddy water being discharged by a waste-pipe. On leaving the strainers, the water flows on to a group of filters having a total surface of 2160 square metres in twelve equal compartments, and composed of a bed of coarse sand 60 cm. thick overlying a layer of gravel and perforated bricks. These are known as "pre-filters," and are intended to run at about 20 cubic metres per square metre.

After aëration between each of these successive operations, the water reaches the final or finishing filters, the total surface of which is 12,600 square metres, divided into 18 filters of 700 square metres each; two of them being covered and constructed under the pre-filters. The finishing filters are composed of a bed of fine Seine sand, 90 cm. thick, supported by a layer of gravel laid on a perforated brick floor; special provision being made to prevent unfiltered water passing down the walls of the filter, and to ensure a uniform rate of flow over the whole area of the filter-bed. The filtered water flows from the finishing filters to a reservoir constructed beneath them, having a total capacity of 19,000 cubic metres, and being in three compartments of unequal size.

The delivery of the strainers is regulated to suit the working of the filters, and to correspond with the increase or diminution in the quantity of water pumped from the works, of which information is given by telephone. The delivery of the pre-filters is regulated by sluice-cocks to correspond with that of the strainers; float-valves being provided to restrict this delivery to the maximum permissible for good results. The delivery of the finishing filters is controlled by a Didelon automatic regulator.

The whole of the construction is of reinforced concrete, and was carried out by the Company from the designs prepared by M. Chabal, Engineer and Technical Director for M. Puech, after consultation with M. Mesnager, the Chief of the Materials Testing Department of the City of Paris, and with other specialists on this form of construction. Owing to the unstable nature of the soil, it was necessary to ensure an equal distribution of the loads to be carried by the foundations, especially on the portions of the site occupied by the reservoirs and by the columns under the filters. The contract for the works, which required 700 tons of round iron and about 3000 tons of cement, was carried out by M. Henry, the Engineer and Contractor for Public Works. The bacteriological analyses of the water purified by a trial plant showed a reduction of 29 per cent. of organic matter, 99·94 per cent. of microbes, and an increase of 96 per cent. in the dissolved oxygen. Subsequent analyses, made at the Montsouris Laboratory, fully justify the expectations of the Company as to the advantage to public health to be obtained from this method of purifying river water.

It only remains to deal with the process employed by the Municipality of Paris for the purification of river water. It consists in filtration through sand—the system employed in many cities in Europe and America. The Municipality possess two filtering installations—one at Ivry, the other at Saint Maur. The Ivry installation comprises 35 filter-beds—16 old ones constructed in 1899, and 19 new ones put into service in 1906. The first 16 beds, each 30 metres square, have a total surface of 14,400 square metres, and the remaining 19, measuring 25 m. by 30 m., a total surface of 14,250 square metres. Of the old filter-beds, eight are preceded by decanting-tanks having a total surface of 1700 square metres; the other 27 are preceded by gravel strainers, or pre-filters, of a total surface of 4410 square metres, or one-fifth of the surface of the filters. The Saint Maur installation comprises six filter-beds, each being 40 metres square, giving a total filtering surface of 9600 square metres, and they are preceded by decanting-tanks of an area of 2100 square metres.

The filter-beds at Saint Maur and the old ones at Ivry are constructed as follows: The total depth of a filter is 2·10 metres; a double row of bricks being laid on the bottom to form drains. These bricks support first a layer of coarse washed pebbles 25 cm. thick, next a layer of finer pebbles 15 cm. thick, and then a layer of gravel 10 cm. thick. Finally, on these layers of pebbles is laid a bed of fine and very clean sand 50 cm. thick. There is thus a total mass 100 cm. deep for the filtering material and its support, over which there is a depth of water of 90 cm. In the new filters at Ivry, the idea was conceived of substituting for the pebbles and gravel, which, with the double row of drain-bricks, means a depth of 50 cm., a sort of perforated floor composed of slabs of low-grade concrete, 50 cm. square and 7 cm. thick, resting on a single row of bricks laid flat and forming drains. These slabs are sufficiently porous to allow of the easy flow of filtered water while retaining the fine sand. They are, moreover, reinforced by six rods of round iron, and easily carry the load to which they are subjected. The porous slabs and the supporting bricks only occupy a depth of 13 cm., whereas the pebbles and gravel take 50 cm. Thus by the new process the filter-bed (sand) gains 37 cm. in depth.

The speed of the filtration of water in the filters is fixed at the unvarying rate of 10 cm. per hour. That is to say, each filter can deliver 2·40 cubic metres of filtered water per square metre of surface per 24 hours (52 gallons per square foot). Automatic apparatus allows of the regulation of the delivery of each filter in a uniform and constant manner. The working of the filter-beds is placed under a special member of the staff, who determines daily, from samples drawn from each filter, whether the water is suitable, from a micrographical standpoint, for the supply of Paris. When the water of a filter is not considered sufficiently purified, it is run back to the Seine until the time when it no longer contains any *bacillus coli*.

As the result of a vote of the Municipal Council, a competition of systems of sterilizing water has also been installed at the Saint Maur works. Each inventor has set up a trial plant on the site of the works. The plants are: (1) Société d'Épuration d'Eau (Desrumaux's sulphate of alumina system). (2) Société de Stérilization des Eaux (Otto's ozone system). (3) Société Industrielle de l'Ozone (Marmier and Abraham's system). (4) Procédé Howatson (chemical process by "ferro-chlore").

NEW RESERVOIRS AT HONOR OAK.

An interesting visit was made by the members of the Society of Engineers, a fortnight ago, to the new reservoirs of the Metropolitan Water Board, at present in course of construction at Honor Oak. They will contain nearly 60 million gallons of water, and will probably be the largest covered reservoirs in the world. The construction generally is of brickwork and concrete, with division walls separating the reservoir into four divisions. The longitudinal centre wall runs approximately north and south; so for the purpose of reference the reservoirs will be known as the north-east, north-west, south-east, and south-west.

The outside walls of those portions of the south-east and south-west reservoirs which are below or level with the natural ground represent in plan a series of flat arches so as to resist earth pressure. The north-east and north-west reservoirs have concrete retaining walls, faced with brickwork. The centre dividing walls are also arched in plan, and are practically double walls filled in between with concrete; the thickness varying from 6 feet in the centre of each bay to 10 feet at each buttress.

Around all the outer walls and the division walls, buttresses in brickwork project into the reservoirs. These buttresses are carried up solid to the drums on the roof covering, and in themselves form substantial counterforts to the walls. The floor of the reservoir is of concrete; and its surface will be formed with curved inverts groined so as to form bases from which the brick piers carrying the roof will rise. This inverted floor will be finished with $\frac{3}{4}$ inch of cement rendering to a smooth polished face, with a drain down the middle of the invert, draining into the collecting channel.

From each base a brick pier is built, which is continued up 14 feet, where jack-arches are turned, connecting each pier north and south. From the top of the wall thus formed, the drums or covering arches spring. The drums form a series of tunnels running north and south. The haunches of the arches are filled with concrete, on the top of which clay puddle will be placed, followed with earth and finally soil. A drain with open joints is laid on the surface of the puddle for the purpose of draining the top of the reservoir. A puddle wall 3 feet thick extends all round the outer walls, and is keyed into the clay—thus making the work watertight.

At the centre of the four reservoirs where the division walls intersect will be the central well, from which the charging and emptying will be directed. All the opening valves—42, 36, and 30 inch—will be arranged round the well, and worked by means of headstocks from a gallery running round the well. By means of special connections, it will be possible to work each or every reservoir at the same time, without interfering with the others. Above the central valve well will be a valve-house, in which the electrical recording indicators will be arranged. When the works are completed, the tops of the reservoirs and the slopes will be soiled and sown with grass seed.

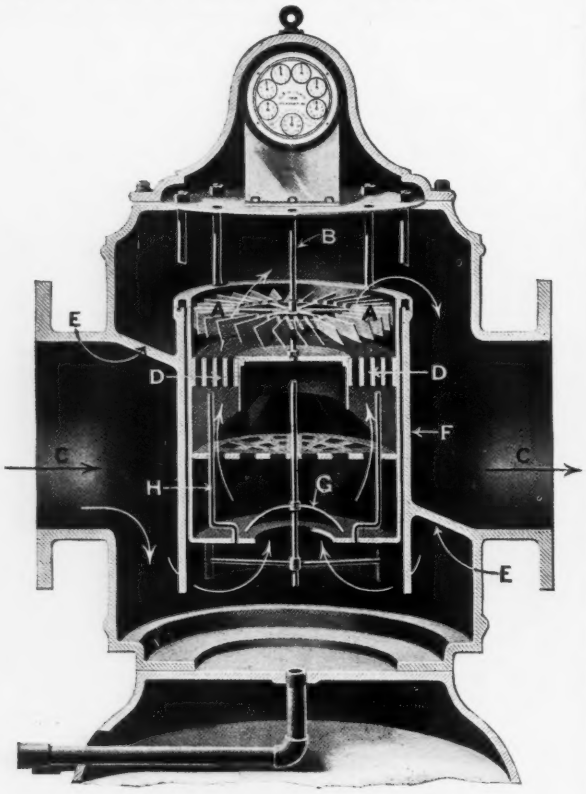
The bricks used in the construction of the reservoirs have all been manufactured by the Southwark and Vauxhall Water Company first, and later by the Metropolitan Water Board, from the excavation. Not only has the material been utilized in the making of the bricks, but the ground has been excavated on the site of the reservoir—thus reducing the quantity of earth to be handled by the contractor. It will be seen that the works involve the use of a large amount of concrete, in the production of which four of Taylor's one-yard concrete mixers are engaged. In these mixers each charge of material is measured and mixed separately, and each of the machines employed will mix 24 cubic yards of concrete per hour.

The whole of the works were designed by Mr. J. W. Restler, M.Inst.C.E., the Engineer to the Water Company, and now the Deputy Chief Engineer to the Water Board; and they are being carried out, under his direction and supervision, by Messrs. J. Moran and Son. The estimated cost of the works, including pipes and valves, but exclusive of land, is approximately £170,000.

The report of the proceedings of the Scottish Junior Gas Association (Eastern District), reprinted from the "JOURNAL," has been issued. The pamphlet extends to 40 pages. In addition to the papers and reports of the discussions, lists are given of the office-bearers and members.

THE ROTARY METER.

This meter, which has now for some time been well known in England, was introduced to the notice of French gas engineers and managers at the meeting of the Société Technique at Nancy. M. Chamon, of the Cie. pour la Fabrication des Compteurs, &c. of Paris, read a short paper descriptive of the meter, a clear illustration of which was given, which is herewith reproduced, together with an abstract translation of the paper.



For a long time past the gas industry has felt the need of measuring large volumes of gas with apparatus rather less bulky and less costly than the type of station meter actually in use. The "Duplex" meter, with two drums on the same axle, to some extent met this demand; but even these meters are too big when it is required to measure the output from large gas-works. The point has again arisen in connection with the utilization of gas coming from coke-ovens and producers. Such gases are really bye-products, and are sold at very low prices—proportionate to their calorific power. The cost and dimensions of apparatus measuring such gases must be reduced to the greatest extent possible. Messrs. Thorp and Marsh's rotary meter fully meets these requirements. It is of small size, taking up one-tenth of the room occupied by the old type of meters by volume for a corresponding hourly capacity.

It consists of a cast-iron body mounted on a stand, with pipe connections C and flanges. The inlet and outlet are separated by an inclined division E connected to the central cylinder F. The whole is surmounted by a cast-iron cover, which contains the dial mechanism. The moveable parts consist principally of a winged wheel A, the wings of which are at 45 degrees, and are mounted on a central shaft B, working so as to reduce loss and wear to a minimum. The shaft is provided at its top with an endless screw actuating the dials. A group of tubes D, placed immediately below the winged wheel, directs the gas from bottom to top. A light valve G prevents the gas from going back; although its principal object is to force small quantities of gas through the tube. It is obvious that as soon as the loss of pressure corresponding to a given quantity is less than the weight of the valve G, this latter will close, and the gas will be obliged to pass by the tube H. It is thus that the required degree of correctness can be obtained up to 10 per cent. of the normal output. This result, which from the point of view of accuracy must be considered extremely satisfactory, has been achieved by the combination of the parts described. The sensitiveness of the apparatus remaining the same, the meter is as exact when new as it is after a long period of use. It contains no part that can be deteriorated by the gas. Such meters are practically independent of the specific gravity of the gases; and they can be used whether the gas is purified or not. In works where coal gas and water gas are made at the same time, it is useful to measure separately the water gas; and the rotary meter offers a cheap means of doing it. It can also be used for measuring the air required for the revivification of purifying material. It was, indeed, for this purpose that the first four meters of 300 cubic metres (10,595 cubic feet) per hour were supplied to the East Greenwich works of the South Metropolitan Gas Company.

Rotary meters are very useful for measuring gas at high pressure, or natural gas, &c.; and they are as correct at a high as at a low pressure. Special apparatus for high pressures, to withstand 10 atmospheres, can be used where ordinary meters could not be adopted. As regards high pressures, it may be remarked that, the volumes being inversely as the pressures, a special arrangement is necessary to correct the record of the amount of gas passing at different pressures. With this object, the apparatus is provided with a special differential arrangement, which gives the results corresponding to the volume at atmospheric pressure. The meter with this automatic arrangement is correct at all pressures. For example, a volume of 100 cubic metres, at atmospheric pressure, passing through an ordinary meter at 4 kilos. pressure, would be indicated by the dials as only 25 cubic metres, the volume having been reduced to one-fourth by compression. With the differential device referred to, the amount registered would be 100 cubic metres, and so on for all pressures; it being understood that the temperature remains the same.

A NEW DIRECT-READING PYROMETER.

In our "Register of Patents" for June 18 (p. 819), we gave a description and sketch of a pyrometer designed by M. Féry. This apparatus, which promises to be of some utility, was the subject of a paper by M. Verdier at the Nancy Congress of the Société Technique; and we give the following translation of it.

To ascertain the temperature of retort-settings is an important point in managing them; and all engineers of gas-works are convinced of their interest in having simple and correct means of measurement of temperature. A great number of appliances, based on different principles, have been brought out—Seger watches, Nouel glasses, the thermo-electric couple of Le Chatelier, the Wanner pyrometer, and Féry's telescopic pyrometer, &c. The number of the solutions proposed shows that no one of them is absolutely satisfactory. The Seger watches require long and delicate handling, and only give relative indications of temperature. Besides this, they do not easily allow of measurements being taken at any point of the setting. The Nouel glasses are wanting in precision; the results varying between one operator and another. The pyrometer of Le Chatelier was the first practical apparatus to allow of exact measurements being taken; but it required a special installation, was costly, and its most serious defect was that it varied after being in use, which necessitated its frequent verification. It could only be graduated in a well-equipped laboratory. In the Wanner pyrometer, the red radiation of the furnace under investigation was compared with the same radiation from an incandescent lamp. The latter had to be frequently corrected by reference to a standard of amylacetate. Féry's pyrometer, which was described at the 1904 Congress of the Société Technique,* marked a notable advance. The graduated apparatus had not to be compared to other appliances; and it could be put into the hands of a foreman, as it only required a little care in manipulation and in the management of its galvanometer, which gave direct readings of the temperatures observed. This galvanometer, however, was a delicate apparatus.

The new solution offered by M. Féry overcomes this objection. It is as simple as possible, requires no galvanometer, and can be entrusted to anybody. It consists essentially of a strip formed of three superimposed metals—silver, gold, and platinum. This strip is about 2 mm. wide, and 2-100ths to 3-100ths of a millimetre thick. The length of the strip is 12 mm., and it is twisted into spiral form—its largest diameter being about 1·5 mm. This spiral is placed in the focus of a spherical surface, receiving the calorific radiations of the body of which it is desired to ascertain the temperature. The heat radiated by the mouth of a furnace is, according to the law of Stéfan, proportional to the fourth power of the temperature of this furnace. In accordance with the well-known properties of bimetallic strips, as soon as ever the spiral receives the calorific rays, it winds or unwinds, owing to unequal expansion, according to the order in which the metals composing it are placed. In practice, the metals are arranged so that the spiral will open. It plays the part of a thermometer; presenting, however, this peculiarity—that its sensibility is greater as the mass is smaller, which is the opposite of expanding thermometers. The smallness of the spiral enables equilibrium to be very rapidly reached, and the spiral in a few seconds takes up the position corresponding to the temperature observed.

To the spiral is fixed a needle working on an indicator or dial. Reading off from this gives the temperature required. Each deflection corresponds to a temperature shown on the indicator. The apparatus is graduated once for all. Before each operation, it is advisable to put the needle back to zero on the indicator, by a screw fitted for this purpose. The indicator is arranged for a series of temperatures from 600° to 1400° C. The apparatus is also provided with an accessory arrangement for automatic starting, allowing of the concentration of the rays on the spiral. The measurement of the temperature is thus made independent of the

* See "JOURNAL," Vol. LXXXVII., p. 31.

distance of the apparatus from the furnace, which is an essential condition for simplicity of observation.

The method of using the apparatus is very simple. All that is required is to open one of the sight-holes of the bed, and to direct the apparatus at the point of which the temperature is required, whether in the nostrils or under the arch of the bed, or even in the inside of the retorts. This can be done without being obliged to go too near; one may be 3 or 4 metres (about 10 feet) away. From tests made with the apparatus, it is found to be exactly comparable to itself. The temperature of the spiral only goes up a few tens of degrees in order to measure temperatures of 1200° to 1400° C.; and the inalterability of the metals forming it is absolute. The pyrometer has, moreover, been admitted to official stamping by the Conservatoire des Arts et Métiers. The solution of measuring temperatures by this apparatus appears to be excellent under all conditions; and it may be of great usefulness in gas-works, owing to its simplicity, which allows of its being placed in the hands of anyone.

METHODS OF INCREASING COKE SALES.

In our review of the proceedings of the annual meeting of the French Gas Society, it will be remembered that it was recorded that the President's Address was almost entirely taken up with the question of ways and means of developing the sales of coke. At his request, also, M. Sar contributed to the proceedings a paper on the subject, of which the following is a summary.

The sale of coke has become more and more difficult, either on account of the competition of other fuels, or by the extended use of electricity for motive purposes. The gas industry ought, therefore, to make a special effort to develop the use of coke as a fuel wherever it can be advantageously adopted. Notwithstanding a previous disposition on the part of the military authorities in France to regard coke as a "*combustible de luxe*," and as taking longer than coal to cook the same amount of food in the military ovens, yet "it may be that, owing to local circumstances, the price of coke will allow of its being used with advantage, and the previous remarks will not apply." (Bulletin Officiel du Ministère de la Guerre, article 56.) Two outlets for coke are especially noticed by M. Sar. The first is the use of coke for producers for poor gas; the second is the adoption of coke by bakers.

As regards coke in poor-gas producers, with anthracite at 45 frs. per (metric) ton, and coal and coke at 35 frs. per ton, the following results are arrived at:—

Fuel.	Ash.	Cost per Horse-Power.	
		In Fuel.	In Money.
Anthracite	7 per cent.	425 grammes	2 centimes
Coal.	12 ,,	550 ,,	2 ,,
Coke	10 ,,	550 ,,	2 ,,

In many cases, coke is preferred as a fuel owing to the certainty of its supply.

M. Sar then deals in some detail with the adoption of coke for bakers' ovens; and he also describes an electrically driven kneading machine. But both these points are of more particular interest and application to the South of France, and therefore need not be further mentioned in our columns. The general lesson, however, that may be profited by is that there are a great variety of ways in which coke sales can be pushed, if intelligent and energetic investigation be applied thereto.

USE OF TAR FOR ROAD MAINTENANCE.

At a recent Meeting of the Association of Municipal and County Engineers, held in St. Andrews, Mr. Thomas Aitken, M.Inst.C.E., the County Road Surveyor of Cupar, read a paper on "The Construction and Maintenance of Roads," in the course of which he made the following remarks on the use of tar.

The application of tar to macadamized roads has occupied the author's attention for many years; and various methods of applying it have been tried, with, generally speaking, beneficial results, but in a manner and at a cost which would not warrant its general introduction. Further consideration of the matter showed that if tar could be applied in the form of a fine spray in recoating operations, the object aimed at would likely be attained. By such means, the ordinary method of applying water and some form of earthy binding material would be dispensed with, and a practically waterproof road formed, which would reduce mud and dust to a minimum. The results of these experiments, favourable in most particulars, led the author to devise an apparatus for spraying tar, either in a hot or a cold state, into the newly-spread coating, so as to act as a matrix or binder, instead of using water and a binding material.

In working the apparatus, it is necessary in the first place to pump air into the receiver to a pressure of from 100 to 150 lbs. per square inch, depending on the viscosity of the tar, before forcing the tar into it from the tank. In order to obtain this pressure, it is necessary to run the vehicle for some time along the road, or it may be accomplished by lifting the wheels clear of the ground, and attaching a driving-belt to a road-roller or traction-engine. Once the necessary pressure is attained, it remains constant, and the machine is at all times ready for working; and when the desired pressure is registered, the valve is adjusted so as to pump in tar, or tar and air, from the tank into the receiver. When the latter is about half-filled with tar, the pressure will rise to from 200 lbs. to 250 lbs. per square inch, when the apparatus is ready for spraying the tar. The outlet-valve may be regulated to give an exceedingly fine spray, or a larger quantity may be applied by opening it to three-quarters or full cock. The supply-regulating valve must be so adjusted that the quantity of tar pumped into the receiver will equal the amount of tar being sprayed on to the road. The metalling is not rolled in the first instance, as in the ordinary system of consolidating the material; the object being to cover all the surfaces of the roadstone with a film of tar previous to consolidation. This is carried out by passing the spraying-machine over the loose metal once in either direction, which, combined with the great pressure exerted in forcing the tar through fine spraying nipples, ensures the whole mass of stones, to a depth varying from 3 to 5 inches, being equally treated. The fineness of the spray secures equal distribution, and the pressure forces it well into the metal coating. After a length of from 30 to 50 yards of full-width coating has been sprayed with tar, a light layer of small chips is applied, to assist in filling the interstices, especially at the surface.

The amount of tar necessary to properly coat the roadstones for every ton of metal applied, varies according to the size of the material used and the quality of the tar; but from four to six gallons may be considered quite sufficient under ordinary circumstances. This quantity of tar would, therefore, with a 3½-inch coat of metal, be equal to 0·56 of a gallon per square yard of road covered. The initial cost of making roads by this system is greater than by the ordinary method. The material after consolidation, however, becomes a homogeneous mass, and internal friction or abrasion is eliminated. The prolongation of the durability of a road so made will be greater—probably doubled—compared with the ordinary method of construction; and consequently ultimate economy is promoted. The surface of a tarred road is practically waterproof, and the elimination of dust and mud, or their reduction to a minimum, would alone be sufficient to justify the general application of tarred macadam.

The cost per day of carrying out the work in the manner described for consolidating 130 tons of metal each day is 13·46d. per ton. The additional cost was 6d. to 8d. per ton more than ordinary macadam. The cost of tarring and rolling a 3½-inch coat of metal is 1·5d. per square yard. On a road 16 feet in width, the additional cost by using tar would be £26·08 per mile over the ordinary method when water is obtained free of charge. On a similar road, but using 6 gallons of tar per ton of metal applied, instead of 5 gallons, the cost would be £35·16 per mile more than consolidating macadam in the ordinary way. The amount of water required per ton of metal by the usual methods of consolidation is about 40 gallons; and when this has to be paid for, the cost may be taken at 2s. 3d. per day. The cost of tar varies considerably in different localities. But the quality is of the greatest importance; and only the best distilled descriptions should be used. The best form of vehicle for spraying the tar is a motor-van having large tank capacity, holding about 800 gallons, which would be more than sufficient for one day's work.

The results of the method of construction or repairing roads described show that the road during and after the trying climatic conditions of alternate frost and thaw presents a smooth compact surface. The "licking-up" of the roadstones by the wheels of vehicles under such conditions on ordinary macadam is very great, and considerable damage is thereby caused. On the tar-macadamized roads, however, experience shows that "licking-up" does not take place under these circumstances; consequently economy is promoted by the reduced cost of maintenance. The method of flushing the tar over the surface or grouting requires from 7 to 9 gallons of tar for each ton of roadstones applied. This quantity is, however, excessive; and it may become sticky and troublesome in hot weather, and may lead to the disintegration of the surface. It is essential that the road metal, chips, and dust should be in a thoroughly dry state, as moisture militates against good work; therefore rolling operations by this process can only be undertaken in fine weather. The finished surface is like asphalt in appearance; and while not quite equal to it in actual wear, it has superior properties in some respects. The macadamized road has a certain amount of resilience; foothold is much better; and it is practically noiseless compared with an asphalt pavement.

The reason why tarred macadam, carried out in a proper manner, is free from dust and mud and wears longer than the ordinary macadam, is simply because the frictional resistance of the stones is increased to such an extent that internal motion and rubbing are prevented, and the tar and chips which fill the interstices of the metal coating prevent percolation of water and the evils resulting from this cause. Tar, no doubt, might be improved by the addition of a bituminous material, which would further increase the life of a road, but, of course, at additional cost.

DURABILITY OF REINFORCED CONCRETE.

At the recent Engineering Conference, the subject of the durability of structures in reinforced concrete was brought forward in two communications in the Harbours, Docks, and Canals Section.

Mr. F. E. Wentworth-Shields opened his paper by expressing the opinion that probably one of the principal reasons why English engineers have hitherto hesitated to introduce reinforced or steel concrete is that it is difficult to speak with certainty about its durability. Only fifty years have elapsed since Monier first used it, and only about ten years since it was employed on any scale in this country. Consequently it is not yet possible to point to any work in steel concrete which has stood the test of centuries; and all we can do is to look at existing structures, and notice carefully how far they have suffered, and what repairs have been necessary. In so doing, we can not only form an idea whether steel concrete is likely to be long lived, but also as to what precautions are necessary when designing to render it so.

The chief things which we should expect to shorten the life of reinforced concrete are: (1) Settlement of foundations; (2) fire and earthquake; (3) atmospheric change—rust, &c.; and (4) abrasion and collision.

Dealing first with settlement of foundations, the author pointed out that steel concrete is a rigid material, and the foundations of a structure of this substance ought to be designed in such a way that they cannot settle. This can always be done, even on soft ground, either by piling or by spreading the weight over a large area on a strong reinforced concrete base. An instance of the evil of neglecting this precaution was to be seen at the Kom Ombo pumping-station in Upper Egypt last year. A culvert of reinforced concrete, 10 feet in diameter, was laid in the Nile silt. The ground had evidently been disturbed beneath it, and the culvert settled down, producing transverse cracks in the concrete. The water escaping from these cracks no doubt aggravated the settlement; and by the time the culvert came to rest, the leakage of water was so serious as to necessitate its being abandoned.

Passing to the effect of fire and earthquake on reinforced concrete, the author said the material was undoubtedly highly fire-resisting. Many experiments had been made to test this; but perhaps one of the most striking proofs is the fire which occurred a few years ago in a warehouse in Baltimore. Not only were the contents of the building destroyed, but its brick walls almost entirely collapsed; the floors, however, which were of concrete reinforced on the Hennebique system, and supported on steel concrete columns, remained intact. With reference to damage by earthquake, Captain Sewell has given an excellent account of the behaviour of reinforced concrete at the San Francisco earthquake. He mentions the museum building at the Leland Stanford University, which had three wings—one of reinforced concrete and two of brickwork. One building received a very severe shaking, and while the brick wings were in a state of collapse, the damage to the steel concrete wing was insignificant.

With regard to atmospheric changes, the author said we have had enough experience of concrete to know that, if good, it is practically unaffected by atmospheric changes. At one time it was feared that the steel might rust, especially in structures under water; but this fear seems to be groundless. Some recent experiments on the permeability of concrete by Mr. Baldwin Wiseman show that, if well made, it is one of the most water-tight materials known, and that it rapidly becomes less and less porous when water is forced through it. Some experiments recently communicated to the American Institute of Electrical Engineers raised the alarm that steel rods immersed in damp concrete rust rapidly when mild electric currents are passed through them. To this the best answer is that well-made concrete should not be, and generally is not, damp. However, the author said the risk should not be overlooked, and care should be taken to exclude electric currents from steel concrete work as much as possible.

Coming to the effect of abrasion and collision, the author said it had been stated that steel concrete has far more resistance than timber to abrasion from shipping or other floating objects. His experience at Southampton, however, convinced him that this was quite exaggerated praise. On the contrary, if reinforced concrete was to be used for marine work, it must be carefully fendered at all parts where it was likely to be struck. In most systems of reinforced concrete the steel is placed within only an inch or two of the surface, and if the structure is not protected by timber cushions, this concrete skin is easily knocked away, leaving the steel naked and liable to rust. The author stated that the coaling-jetty at Southampton (completed 2½ years ago) suffers as much, perhaps, from the blows of ships and barges as any steel concrete structure yet made. It is protected by fenders of American elm; and in spite of blows which have caused the whole jetty to sway, there is no sign as yet of the concrete spalling off, except at one or two places where the blow has fallen direct on the concrete.

In conclusion, he thought that, on the whole, it might be said that our experience goes to prove that reinforced concrete, if well designed, is likely to be one of the most durable building materials—if not the most durable—that can be found.

The other paper was entitled "Ferro-Concrete Structures;" the author being Mr. C. Scott Meik. At the outset, he assumed that the method of constructing ferro-concrete was understood by all engineers, and therefore he merely drew attention to certain points in connection with its manufacture which should be specially attended to. His experience of the construction and durability of ferro-concrete was gained chiefly in connection with piers and wharves, particularly a pier at Purfleet on the Thames, built for the purpose of discharging coal from steamers into craft in the river or waggons on the pier, and the reconstruction of a pier in Italy.

The Purfleet pier is supported on piles 14 inches square, driven from 15 to 18 feet into the river bed, and well braced together, the decking consisting of ferro-concrete, 5 inches thick, covered with 2½ inches of tarred gravel paving. The piles were made on shore, and driven from a timber staging, and were each from 40 to 45 feet in length. The approach from the shore to the pier was constructed partly on piles 14 inches square and partly on columns 5 feet in diameter; the former being used at the shore end, and the latter below low-water line, in order to allow of larger spans being used for the passage of barges and boats. Between the pier proper and the approach to it, is a bridge of about 60 feet span, consisting of ferro-concrete bow-string girders and flooring. The pier has to carry four transporter cranes, each weighing upwards of 80 tons; the maximum downward pressure on any one pile being about 25 tons.

The form of the section of bars, provided the area is sufficient, is of little moment; the friction of the steel in the concrete varying but slightly in all cases. A little rust on the bars is no objection, as it increases the friction. The round bar offers most facility for getting the steel thoroughly embedded in the concrete. The stirrups, or iron bands for holding the round steel bars in place, must be so formed as not to give until the limit of elasticity has been reached. At Purfleet those first used stretched, owing to not being efficiently connected; and under test a section of pile crushed prematurely, because of the round steel bars buckling outwards at the centre. The object of the use of the stirrups is to prevent this. The test-piece referred to was part of a 14-inch pile, 5 feet in length, which crushed under a stress of 221 tons, or 1·13 tons per square inch. An improved form of stirrup was subsequently used, which increased the strength of the pile or column to a large extent. The round bars in the framework of the pile must also be efficiently strutted by diagonals to hold it rigid until the concrete mass has set hard in and around the framework of steel.

It is necessary to crush the aggregates of the concrete small enough to pass through a mesh of ¾ inch diameter, in order to permit the concrete to get into all the interstices of the steel framework; and to ensure this the concrete should be well rammed in with suitably shaped rammers. The ramming of the concrete does not have much effect on its strength after it has been made for twelve months. Experiments of blocks 12-inch cube prove this. A cube of 12 inches of rammed 4 to 1 concrete edge crushed at 265 tons, or 1·84 tons per square inch; and a similar cube of 4 to 1 concrete made in the ordinary manner failed at 258 tons, or 1·80 tons per square inch. Both blocks were 18 months old at the time of testing. The ratio of cement to aggregates should be 6 to 1 for ordinary beams and floors, and 4 to 1 for piles and columns to carry heavy weights. In the upper end of piles, for a length of 1 foot, it should be 3 to 1.

The author's experience, so far as it extends, proves that the deterioration of the steel in the concrete, provided the latter is properly made, is a negligible quantity. Numerous rust-marks have appeared on the piles in the pier at Purfleet since its construction; but the greater number of these are due to nails accidentally mixed in the concrete, and embedded in it close to the surface. In the few cases where the water has gained access to the steel bars, there has been no difficulty in cutting out the defective concrete and making good with cement. A pile end, which had been in the sea for eight years at Southampton, was lately on view at Paddington Station. The exposed steelwork on this specimen was much corroded; whereas the bars in the body of the concrete, on being cut open, were found to be quite free from any rust, and as fresh as on the day they were put into the pile.

Coming to the question of cost, the author said that at Purfleet the piles cost about 5s. 6d. per cubic foot, bracings about 5s. per cubic foot, and the decking was 20s. per square yard. The cost of the pier proper on which the cranes are placed worked out to 17s. 8d. per square foot of surface, and that of the pier approach to 10s. 2d. per square foot. He added that these prices were on the high side, owing to the great height from the decking to the points of the piles—as much as 70 feet in some instances—and also to the fact that the pier was designed to carry very heavy loads. On the other hand, the price for piles was low if the difficulty of driving them into the compact Thames ballast is taken into account.

In Mr. Meik's opinion, ferro-concrete is to be preferred to timber for marine structures, as it is immune to the attacks of the sea-worm. On the other hand, timber is easier to repair when damaged by collision. As regards cost, ferro-concrete is about the same price as green-heart timber; while it is about 1s. to 2s. per cubic foot dearer than pitch-pine at its present price. As to structures on land, ferro-concrete is preferable to timber, as it is absolutely fireproof, and can be made as strong as steel in building and stagings, provided weight is not an objection. For large buildings, it works out cheaper than stone, and is much lighter—a consideration when the foundations are defective.

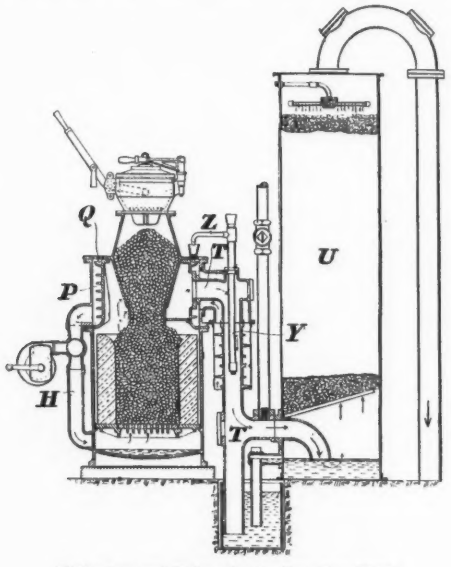
REGISTER OF PATENTS.

Suction Gas Producing Plant.

BICKERTON, H. N., ROBSON, P. W., and the NATIONAL GAS-ENGINE COMPANY, LIMITED, of Ashton-under-Lyne.

No. 13,703; June 14, 1906.

In suction gas producers as at present constructed, the patentees remark, it is usual to provide around a hot portion of the producer a vaporizing chamber through which the air supply is drawn and into which water is delivered for supplying the requisite steam for the producer. In the "best practice" hitherto, this vaporizing chamber has been filled with material—metallic turnings or the like—to increase the evaporative surface. It is found, however, that after awhile the chamber becomes more or less choked or locally channelled (especially where hard or impure water is used); and it becomes necessary to clear out the chamber and renew the turnings. With producers as hitherto constructed, however, this cleansing and renewal has been a difficult matter—involving the dismantling of the producer and the breaking and remaking of jointing which must be kept air-tight in operation.



Bickerton and Robson's Suction-Gas Plant.

The primary objects of the present invention are to provide a suction producer with an improved vaporizing chamber, which may be easily opened up or removed without breaking any of the principal joints of the producer, and to provide large evaporative surface of a character which shall not become choked or locally channelled when used for long periods, even with hard water. Further objects are to provide improved air and feed-water devices and an improved air-supply arrangement for use in starting the apparatus.

The producer is made with a lower body portion consisting of one or more cylindrical parts having at the top a flange, to which an upper flanged portion of the producer is secured by a tight and permanent joint. The upper portion is preferably of smaller diameter than the lower. The top of the upper portion has a flange which supports a coal-container; a tight and permanent joint being made at this flange also. A coal-feed regulating device is mounted upon the top of the coal-container. A refractory lining is carried by the lower part of the producer above a closed ashpit.

Around the upper portion of the producer there is placed a circular casing, the top of which carries a flange, upon which may be secured a circular plate extending across the top of the vaporizing chamber P, which is formed by this casing and the top portion of the producer. By disconnecting the bottom of the casing from the producer, it may be removed without breaking any of the main joints of the plant.

Near the top of the upper portion of the producer is a trough extending horizontally around the apparatus and projecting into the vaporizing chamber. Water to be vaporized is delivered to this trough, the edge of which is provided with a number of V grooves, through which the water overflows. Below the trough is a series of horizontal ribs, extending around the producer, each rib being of somewhat greater width than the one next above it, whereby the water trickling down the side of the upper portion of the producer is spread out and prevented from dripping through more than a short distance. The interior of the upper portion of the producer is provided with vertical ribs, which serve to strengthen this part of the producer as well as to extract from the gases heat for transference to the vaporizer.

By their invention the patentees claim to be able to avoid the difficulties met with in vaporizers which employ turnings or other porous filling, and to obtain one which is capable "of almost instantaneously raising the steam required for gas making; the ability of the plant to quickly respond to fluctuations of load being greatly increased by the fact that there is practically no reserve of water contained in the vaporizer as is done in other producers."

The gas outlet pipe T from the producer is passed on its way to the scrubber U concentrically through an air-conduit, which opens into the vaporizing chamber around the gas outlet. The exterior of the outlet pipe is provided with ribs, which are preferably arranged spirally, so that the air is highly heated before it enters the vaporizer, on account of the long path of contact with the hot walls of the outlet pipe. It is important that the air shall be considerably preheated, in order that it may carry the requisite amount of steam into the fire. By these means the necessary heat is obtained from the outflowing gases passing to the scrubber.

The feed water is heated also by the outflowing gases. This is effected by inserting through a stuffing-box in the outlet pipe a tube Y, closed at the inner end, into which is inserted a pipe of smaller bore—after the manner of the well-known "Field" tubes in certain water-tube boilers. The hot feed water is withdrawn by a pipe Z at the top of the "Field" tube and delivered to a mouthpiece communicating with the trough Q of the vaporizer.

A fan is connected to the generator in a manner which greatly increases the facility and convenience of starting the plant—*i.e.*, the outlet branch of the fan is united to a junction on the pipe which conveys air and steam from the vaporizer to the ashpit. In this junction piece is a deflector, which may be placed so as to shut off the vaporizer from the ashpit and establish communication between the fan and the ashpit, or to shut off the fan and establish communication between the vaporizer and the ashpit. By this means the usual cocks and blank plates such as are adapted in most existing plant are dispensed with.

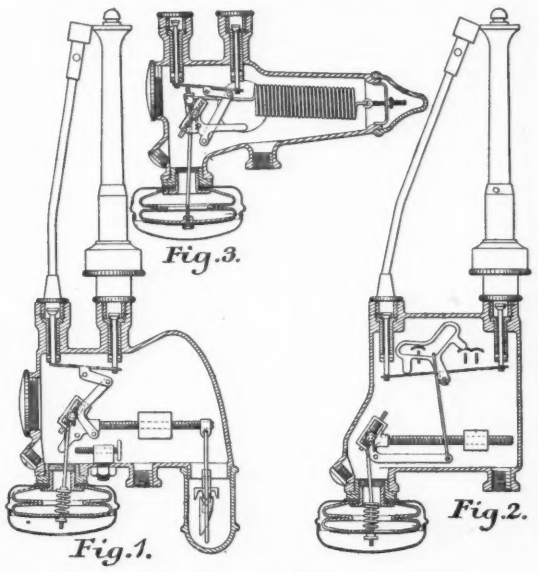
Lighting and Extinguishing Gas-Lamps from a Distance.

ELTON, E. H., and STEPHENS, R., of Clevedon.

No. 15,067; July 2, 1906.

This invention relates to apparatus to be used in connection particularly with street-lamps—for lighting and extinguishing them from a distance by variation of pressure in the mains.

The lamps are each provided with a pilot light for lighting the main burner; and there is in the pipe or passage by which the gas from the main communicates with the burner a closed chamber, containing (or in communication with) a bellows or flexible diaphragm in or on which the gas pressure admitted to the chamber acts, and through it and through a weighted lever, or system of levers, causes a valve or valves to be operated so as to admit gas, and cut off the supply of gas alternately, to the main burner and to the pilot light of the lamp. The valves are so arranged and operated that when the main burner is alight the pilot light is extinguished, and *vice versâ*.



Elton and Stephens Gas-Lamp Lighter and Extinguisher.

The valves, according to one arrangement, are connected to, or are acted on by, a lever connected by an arm and link to another lever, which also works on a fulcrum within the closed chamber and is provided at its free end with an adjustable weight; or in conjunction with the lever a spring may be employed by means of which the pressure of gas required to operate the valves can be regulated as desired. This lever is connected to the bellows or flexible diaphragm by an adjustable screw connection; and according to the distance this connection is from the fulcrum of the lever, so will depend the pressure required to operate the valves to effect the lighting and extinguishing of the lamp burners or vary the difference of pressure required for lighting and extinguishing them. The adjustment of the connection of the bellows to the lever to which the valves are connected can be effected by screw and nut arrangement carried by the lever; and instead of an adjustable weight or spring, the lever may be provided with a screw adjustment to vary the pressure required to operate the valves.

A separate valve may be provided for each of the passages to the main burner and to the pilot light, or a single valve of suitable construction may be provided for governing the two passages in such manner that when the pressure on the main rises to a predetermined point the gas will be admitted to the main burner, and when it is reduced below it the supply of gas to the main burner will be cut off.

If one main burner is to be lighted at high pressure and retained alight while the low pressure is extinguishing the other main burners and eventually to extinguish the single main burner at low pressure preceded by a temporary high pressure, there may be loosely hung from the lever to which the bellows is attached a swinging arm, the lower end of which is arranged to engage a fixed catch or projection.

This arm is provided for the purpose of retaining the burner alight when the gas pressure is reduced—for example, when the pressure increases the bellows will raise the arm so that its lower end will slide up an inclined surface of the fixed catch to above the upper end of it. Then if the pressure is reduced, the lower end of the arm will descend into contact with the upper surface of the fixed catch, and thereby keep the valve in the passage communicating with the main burner open. Then to extinguish the light the pressure is again raised, thereby raising the arm, which will then swing and pass off the top surface of the fixed catch, so that when pressure is again reduced the arm will descend, together with the lever, below the fixed catch, and thereby close the valve leading to the main burner and open the valve of the passage leading to the pilot light.

The fixed catch may be provided with a number of stops in different positions, so that any one of a number of lamps, or one series of lamps, can be lighted and extinguished separately.

Instead of making the arm to swing on the lever, it may be rigidly connected to the lever and the catch be made moveable; and instead of connecting the valves to the lever to which the bellows or diaphragm is attached, they may be connected to a rocking lever, having inclined slots or a double inclined slot in it—one inclined slot being arranged on each side of the fulcrum of the lever. In them enters a projection from an arm or link pivoted to the lever connected to the bellows or diaphragm, so that the lamp can be both lighted and extinguished at high pressure, and the slotted lever can be provided or combined with catches or stops for the projection on the pivoted arm or link to engage with. In this way, any one of a number of lamps, or the lamps of any area of a number of areas of lamps, or one or more lamps of a cluster of lamps, can be separately lighted or extinguished.

Fig. 1 represents in sectional elevation the general construction and arrangement of one form of the apparatus as applied to a single lamp, the main burner of which is caused to be lighted by high pressure of gas and extinguished by low pressure. In conjunction with it are shown means for retaining the main burner of the lamp alight while other main burners are caused to be extinguished—the first-named main burner being eventually caused to be extinguished by a temporary high pressure and a subsequent low pressure of gas.

Fig. 2 illustrates an arrangement adapted both to light and extinguish the main burner of the lamp by temporary high pressures of the gas. In combination therewith are shown stops and guards whereby any one of a number of lamps, or the lamps of any area of a number of areas of lamps, or one or more lamps of a cluster of lamps can be separately lighted or extinguished.

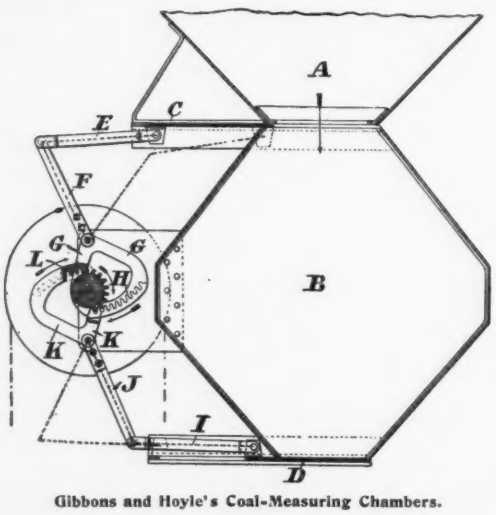
Instead of the lever provided with an adjustable counter-pressure weight as described, there may be substituted a spring (as shown in fig. 3) connected at one end to a boss on a stud adjustable on a screw carried in a bracket attached to the stud. The latter stud is adjustable on the lever, and is connected to the bellows or diaphragm by the rod, as already described. By the use of this combination of adjustable stud connections, the differences in the gas pressures required to light and to extinguish the main burners of the lamp may be regulated to any desired degree.

Measuring Chambers for Coal.

GIBBONS, W. P., and HOYLE, H. P., of Lower Gornal.

No. 17,234; July 31, 1906.

This invention consists of the herein described improvements in and connected with measuring chambers for delivering measured quantities of coal and other substances, and particularly for delivering measured quantities of coal for charging gas-retorts, boiler firing, and other purposes.



Gibbons and Hoyle's Coal-Measuring Chambers.

The illustration shows a front sectional elevation of the lower part of a coal-hopper and measuring chamber and its sliding doors with the invention applied to it; the doors and mechanism being shown in the positions they occupy while the measuring chamber is being filled from the hopper.

The upper sliding door C is connected by the connecting link E to the upper end of the lever F, which is mounted on a fulcrum shaft carried by side bracket plates from the sides of the measuring chamber B. Below the fulcrum the lever is prolonged at G and formed with an internally toothed curved rack or sector H, which gears with a toothed sector pinion mounted on a counter shaft, also carried in bearings by the bracket plates. The bottom sliding door D is connected by a link I to the lower end of a lever J, mounted on a fulcrum shaft carried by the bracket plates and prolonged at K beyond the fulcrum. At its outer part it is made with an internally toothed curved rack or sector L, which also gears with the sector pinion, but at the opposite side of it to the rack H. The sector pinion is made with teeth around only about half its circumference, adapted to engage alternately with the curved racks H and L.

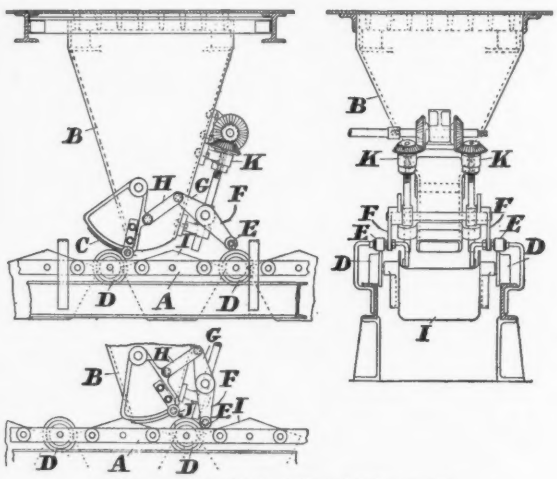
Assuming that the bottom door D of the chamber B is closed as shown, and that the top door C is open and the chamber B is filled with coal from the hopper A above it, then when the operating shaft is turned in the direction indicated by the arrow the teeth of the sector pinion gear with the toothed rack part H of the operating lever F and gradually closes the door C; but the bottom door D remains stationary and closed, because the plain part of the sector pinion is adjacent to the toothed rack part L of the lever J belonging to the door D. When the door C has thus been closed the last tooth of the sector pinion has passed the toothed rack of the lever F, so that the door C remains closed; and as the rotary movement of the sector pinion is continued, its teeth gear with the toothed rack L and commence to open the sliding door D. The movement is continued until the door is fully opened and the contents of the measuring chamber have been discharged. The operating shaft and the sector pinion are now rotated in the opposite direction, so that the door D is first closed; and after this has been done, the last tooth of the sector pinion has left the toothed rack of the lower door, and now the teeth of the sector pinion commence to gear with the toothed rack of the lever F, so that the door C commences to open. This movement is continued until the door is fully open and the measuring chamber B is again filled from the hopper A.

Feed Gear for Conveyors and Elevators.

EDGAR ALLEN AND CO. and JAMES, C. W., of Sheffield.

No. 17,624; Aug. 4, 1906.

This invention relates to gear for feeding conveyors and elevators, provided with swivelling buckets; the object being to so regulate the feed of the material that the quantity fed into each bucket shall be evenly distributed and the fall of material between the buckets prevented.



Allen and James's Feed Gear for Conveyors.

Above a portion of the conveyor A, which travels in a horizontal direction, is placed a hopper B, provided with a radial sliding door C at its bottom orifice, the movements of which are actuated by the travelling wheels or runners D of the conveyor which come into contact with rollers E J. For the opening movement, the rollers E, attached to levers F, are so arranged that when the travelling wheels D of the conveyor come in contact with them one arm F of a double lever, to which they are attached, is lifted, while the other arm G, which is connected by a link or bridle H to the side of the door, is depressed and causes the radial door C to open backwards. In this way, the feed into the buckets I commences from the front edge of the hopper orifice into the leading or front end of the swivelling bucket; and by the time the trailing end of the bucket is opposite the back edge of the hopper, the door is fully open. At the same moment the other rollers J, attached to the door C, come in contact with the next or following pair of conveyor wheels D—closing the door during the time the space between the two buckets is passing under the hopper. The moment the door is closed, the first rollers E, which by the motion of the closing of the door have been brought back to the first position, come in contact with the same pair of conveyor wheels D as effected the closing of the door, upon which the opening movement as first described is repeated, and so on continuously for every pair of wheels and every bucket in the conveyor.

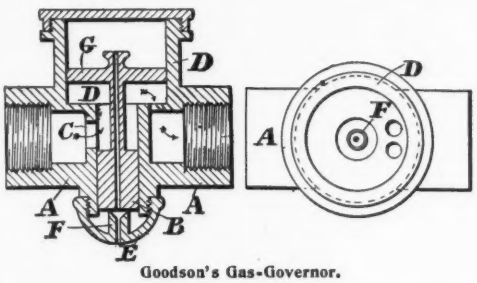
Gas Regulator or Governor.

GOODSON, J., of Maze Pond, S E.

No. 20,846; Sept. 19, 1906.

This automatic gas regulator or governor is intended to control the pressure of gas supplied to a variable number of burners notwithstanding variations of pressure in the service-pipe, so that should any of the burners under control be turned off or on, the remaining ones would be practically unaffected. The arrangement comprises: A cylinder and a piston working in it—the space above the piston having a vent

or outlet to the atmosphere, while the space below the piston (through which the gas is caused to pass) communicates with an outlet for the gas; a valve-chamber below the cylinder in communication with the space below the piston; and a valve controlling the inlet to the valve chamber and cylinder and connected with the piston. A removable cover closing the top of the cylinder enables the piston and valve to be removed and easily cleaned.



Goodson's Gas-Governor.

The governor comprises the lower barrel portion A, internally screw-threaded at opposite ends and adapted to be inserted in the service-pipe. Between the inlet and the outlet end, a cylindrical valve chamber is formed transversely to the axis of the barrel, and in which the valve B is guided. The valve-chamber communicates at one side, through a port C, with the inlet; while its upper end opens into a cylinder D, arranged co-axially with the valve-chamber. At its lower end the valve-chamber or guide is closed by a screw cap E, provided with a central stop or rest F, which supports the valve when in its lowest position. A piston G, formed integral with the shank or spindle of the valve, works in the cylinder D; being raised and lowered as the pressure of gas varies—thus raising and lowering the valve which controls the inlet port. The top of the cylinder is closed by a screw cap or cover, and a vent is provided in the cylinder just below the flange of the cap, or, as shown, it may be formed by boring through the piston and valve, and may communicate with an outlet in the lower cap E. This vent maintains the part of the cylinder above the piston at atmospheric pressure.

In operation the gas passes in the direction of the arrows, through the port C, to the space below the piston G, and from thence through openings to the outlet; being throttled more or less at C according to the pressure.

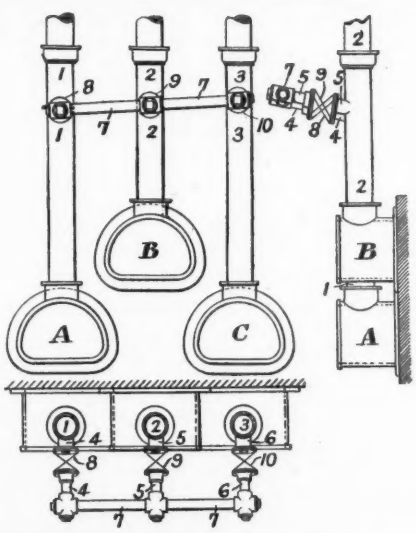
Preventing Choking of Ascension Pipes of Retorts.

GIBBONS, W. P., of Lower Gornal, and JUDD, G. H., of Sheringham.

No. 24,418; Nov. 1, 1906.

This invention is designed not only to prevent choking of the ascension pipes of gas-retorts, but it "also has the effect of making more gas per ton of coal, and of a more uniform quality, than is possible with the ordinary arrangement of ascension pipes, which are usually independent of each other and form separate and independent passages from the various retorts to the hydraulic main."

It is well known, the patentees remark, that the gas from a retort freshly charged with coal contains more moisture than that given off in the latter part of the time during which the coal is allowed to remain in the retort. It is also well known that the stopping up of the ascension pipe is "largely due to the dry condition of the gas passing therethrough at the latter end of this period." They therefore "provide means whereby the gas from the freshly-charged retorts is to some extent passed up the ascension pipes of the retorts to be charged next, or next but one, and in which the gas contains less moisture."



Gibbons and Judd's Arrangement of Ascension Pipes.

In the arrangement illustrated, in order that some of the gas from one or more retorts can be conveyed to the ascension pipe or pipes of some other retort or retorts, each of the ascension pipes 1, 2, and 3 is made with a branch pipe 4, 5, or 6, a short distance above the mouthpiece, and connected together by a separate connecting pipe 7 of a smaller diameter than the ascension pipes. Each branch is fitted with a valve 8, 9, or 10; the arrangement being such that all the ascension pipes in the bed, or any of them, can be connected together, so that some of the gas from any of the mouthpieces A, B, C can, after passing up the lower parts of the ascension pipes 1, 2, and 3, below the connecting pipe 7, be caused to pass along the connecting pipe 7 and up the ascension pipes belonging to some other retort or retorts. The connecting pipe 7 is by preference made to slant across the whole of the ascension pipes or across any group of ascension pipes in the bed, so as the better to free itself from obstructions; or, if desired, the pipe may slant both ways to or from the central ascension pipe of the bed or of the group of ascension pipes, or be otherwise arranged so that there will be sufficient fall for the tar and liquor to properly run down and prevent the connecting pipe being choked.

The method of working the retorts A, B, C, having their ascension pipes 1, 2, 3 connected together, would be as follows: Assuming, for instance, that the retort A is charged at eight o'clock, the retort B at ten o'clock, and the retort C at twelve o'clock. Then, immediately after the retort A has been charged, the valve 10 of the retort C is closed and the valves 8 and 9 are opened. Thus some of the gas from the retort A can pass along the pipe 7 and up the ascension pipe 2 of the retort B. Immediately after the retort B has been charged, the valve 8 of the retort A is closed, and the valves 9 and 10 are opened. Thus some of the gas from the retort B can pass along the pipe 7 and up the ascension pipe 3 of the retort C. Immediately after the retort C has been charged, the valve 9 of the retort B is closed and the valves 10 and 8 are opened, so that some of the gas can pass from the retort C along the pipe 7 and up the ascension pipe 1 of the retort A; and so on in the same rotation.

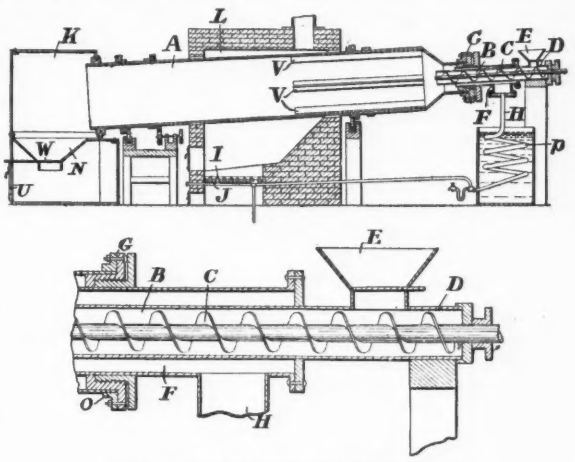
Or the retorts may be worked in the following manner: Immediately after the retort A has been charged, the valve 9 belonging to the retort B is closed, and the valves 8 and 10 are opened, so that some of the gas from the retort A can pass along the connecting pipe 7 and up the ascension pipe 3 of the retort C. Immediately after the retort B is charged, the valve 10 belonging to the retort C is closed, and the valves 8 and 9 are opened, so that some of the gas from the retort B can pass along the branch pipe 7 to the ascension pipe 1 of the retort A. Immediately after the retort C has been charged, the valve 8 of the retort A is closed, and the valves 9 and 10 are opened, so that some of the gas can pass from the retort C, along the branch pipe 7, up the ascension pipe 2 of the retort B.

Distilling and Carbonizing in Revolving Retorts.

ROBINSON, E. B., of Hurlet, near Glasgow, and EDWARDS, W. C., of Rockland, Ontario, Canada.

No. 24,961; Nov. 6, 1906.

This invention relates primarily to the simultaneous distillation and carbonization of sawdust, chipped wood, and wood refuse, with the object of recovering from them "by a continuous process, a maximum amount of volatile and solid product." It consists of apparatus in which the material is distilled and carbonized in a continuously rotating retort while continuously applying heat thereto, and collecting separately the volatile and solid products. The cylindrical retort is supported with its axis slightly inclined to the horizon and rotated by any suitable means; the volatile products resulting from the operation of the process being withdrawn from the upper end of the retort and the non-volatile products from the lower end.



Robinson and Edwards's Revolving Retort.

A is the retort supported at intervals on rollers with its axis slightly inclined to the horizon—preferably by the means shown, comprising fixed seats of rollers which run on tracks secured to the outside of the retort. Means are provided for rotating the retort—such as a driving pinion which engages an annular gear secured to the outside of the retort.

The heating of the retort may be accomplished by a masonry chamber L, which encloses the retort for a portion of its length. This chamber is provided with the usual grate-bars directly below but within the combustion chamber. If desired, steam, or superheated steam, may be introduced into the interior of the retort to assist in the carbonization and distillation. The raw material is introduced into the retort at or near the upper end—a feeding device B being provided to effect its introduction and passage therein.

This feeding device comprises a rotary spiral conveyor C, which operates in a fixed tube D extending to the end of the retort. To feed

the material into the conveyor tube, a hopper E is connected externally, and is provided at the bottom with a slide adapted to close the hopper and prevent the escape through it of the volatile products within the retort when the material is not being fed into it.

Connected to the tube D, and encircling it, is a second tube F, through which the volatile products pass to the condenser or may be withdrawn. The outside of this tube is connected to the end of the retort by a gland G, which, during the rotation of the retort, prevents the escape of the volatile products. This gland may be of any design; but that shown comprises an annular ring the inner side of which bears on the outside of the tube F—the ring having a screw-threaded engagement with a like ring bolted to a third ring secured to the end of the retort.

The tube F is connected at a point outside the retort to a conducting tube H, which leads to the coils of a worm or any other form of condensing apparatus. The gaseous products passing through uncondensed and in the condenser may be withdrawn and burned to assist in heating the retort.

With this end in view, there is a conducting pipe connected to the coil and leading to a burner J (of any suitable type) below the grate-bars in the heating-chamber. To enable the volatile products to be withdrawn more readily, a steam-jet exhauster is located in the pipe, or a vacuum pump or fan exhauster might be employed in place of the steam-jet exhauster.

The non-volatile products are withdrawn through the end of the retort by any desired means, such as a fixed collecting chamber K connected to the end of the retort by a gland. The bottom of the collecting chamber is made in the form of a hopper N, which empties into a second chamber O, provided with a door through which the material may be withdrawn. The bottom of the hopper is furnished with a slide by means of which the hopper may be closed when the door is open to withdraw material, thereby preventing the entrance of air into the heated retort. If desired, this collecting chamber may be dispensed with, and the products may be withdrawn by means of a spiral conveyor extending into the end of the retort.

To mix the material during its passage through the retort, and to prevent caking, there are a number of mixing blades secured to the interior of the retort.

The material to be distilled or carbonized is fed into the hopper E, whence it will be conveyed by the conveyor C to the upper end of the retort A. The retort being slightly inclined to the horizon, the material will, under the action of gravity, be fed therethrough; and as the retort is continuously rotated, it will be rotated and "present different parts thereof to the action of the heat" during passage through the heating chamber L. In this way "all the parts of the material receive a continuous and equal amount of heat, which makes the distillation and carbonization uniform throughout." The mixing blades operate on the material to keep it in a finely-divided state and prevent caking.

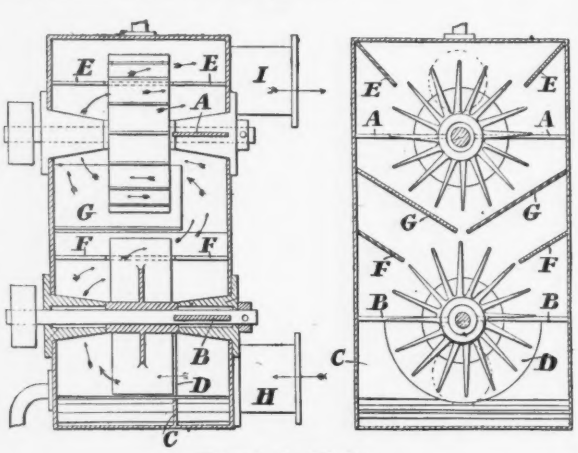
The action of the heat both vaporizes and carbonizes the material; the volatile products passing off into the continuous coil at the upper end, and being therein condensed or else passing off uncondensed. The non-volatile or carbonized products pass down and fall through the lower end of the retort into the collecting chamber K, whence they may be withdrawn. The gaseous products which do not condense in I are burned at J to assist in the heating of the furnace, and thus effect an economy in the operation. The products of distillation and carbonization will, it is said, be found very uniform in their character, "owing to the thorough exposure of all particles of the raw material to the action of heat."

Gas-Washing Machines.

WILSON, A., of Stafford.

No. 29,471; Dec. 27, 1906.

This invention relates to gas-washing machines where paddle-wheels are employed for agitating the gas and causing intimate contact of it with the water contained in the apparatus.



Wilson's Gas-Washer.

The illustration shows sectional elevations at right angles to one another, of one construction of such machine.

The paddle-wheels are fixed on shafts supported in upper and lower bearings on opposite side walls of a casing; the shafts being provided with driving pulleys. A B are upper and lower horizontal partitions in the casing, and C is a vertical partition fixed in the lower part of the casing below the lower horizontal partitions and formed with a semi-circular opening D, which extends in front of the lower half of the lower paddle-wheel at the gas entrance end of the casing. A number of deflecting or baffle plates E F extend inwardly and downwardly from the opposite ends of the casing, and are located in a suitable position in relation to the paddle-wheels, as shown. G are other inwardly and downwardly inclined plates arranged below the upper paddle-wheel, so as to form a doubly inclined bottom extending across a portion of the upper part of the casing and having a central delivery opening through which the water can pass from the upper part of the casing and be brought into "direct and effective" contact with the paddle-wheel in the lower part. Water is admitted to the top of the casing, so as to fall upon the upper paddle-wheel. The greater part of the water thrown off by wheels, instead of running idly down the sides of the casing, is caught by the deflecting plates and is again returned to the paddle-wheel; the water, together with the gas, passing through the central opening into the lower part of the casing, where it will be similarly acted upon by the lower revolving paddle-wheel and plates F. The water finally escapes from the lower portion of the casing, through a pipe dipping into a water seal.

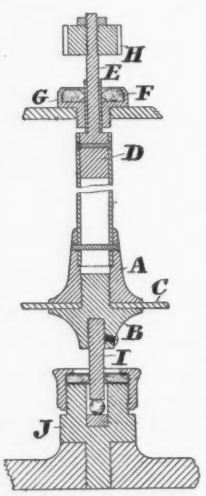
The gas to be washed enters through the pipe H and passes to and fro between the floats of the revolving wheels in the direction of the arrows before it finally escapes "in a purified condition" from the top of the casing through the pipe I.

Turbine-Wheel Gas-Meters.

THORP, T., of Whitefield, near Manchester.

No. 3140; Feb. 8, 1907. Date claimed under International Convention, July 9, 1906.

This invention relates to turbine or fan-wheel gas-meters as described in patent No. 20,214 of 1901.



Thorp's Turbine-Wheel Gas-Meter Spindle.

When such gas-meters are used for carburetted water gas, enriched coal gas, oil gas, and the like, oily liquids of condensation are found to be deposited in the spindle bearings, clogging them and preventing the "nearly frictionless rotation required for the fan-wheel spindles of such meters" and so "injuriously affect the correct registration of the meter." In some cases, too, where coke-oven, generator, or furnace gases have to be measured and are not perfectly washed, gritty particles are contained in the gas, which become mixed with the oil in the footstep and impede its rotation. The object of this invention is to remedy these defects.

As represented, the spindle consists of a hollow tube fixed in a boss A, into which another boss B is screwed—the bosses gripping the disc C of the fan-wheel between them. Into the upper end of the spindle, a plug D, formed with a pivot E, is fixed. The pivot has a hard brass sleeve tightly driven upon it, which revolves in an agate ring F fixed in the screw plug G—the latter screwed into a horizontal plate. At the top, the pivot has a pinion H fixed upon it, by which the rotation of the spindle is transmitted to the register.

Into the bottom of the boss B a hardened steel pivot I is screwed, which enters into the iron footstep bearing J. The latter is screwed into, or fixed on, the plate underneath the disc C of the fan-wheel, and is bored out to a larger diameter than that of the pivot I. Preferably a hardened steel plate or agate plate is inserted into the bottom end of the bore, and a hardened ball of smaller diameter than the bore is between the pivot and plate. Upon the top of the bearing J an agate ring is fixed by means of a cap screwed upon the bearing J—leather washers being interposed between the ring and the metal parts. The space surrounding the pivot I and the ball is filled with mercury. When the spindle rotates, the ball makes a gyrating movement, and "an almost frictionless motion is assured;" while the mercury "effectually prevents the entry of oil and grit into the footstep bearing, which requires no further attention and does not become clogged while the meter is stopped for a time."

APPLICATIONS FOR LETTERS PATENT.

13,955.—BRÜCKMANN, O. J., "Gas-producers." June 17.
14,063.—HUNTRODS, L., "Supporting mantles." June 18.
14,078.—EDGAR, W., "Fuel for gas-fires." June 18.
14,091.—WHITE, F. R., "Gas-engines." June 18.
14,112.—THORP, T., "Water-meters." June 19.
14,127.—POTTER, W. G., "Incandescent burners." June 19.
14,158.—HOLMAN, S., "Burners." June 19.
14,161.—WAKEFIELD, H., "Incandescent burners." June 19.
14,162.—PLUMSTEAD, E., and NEWTON AND LAWRENCE, LTD., "Igniting gas electrically." June 19.
14,197.—MANSFIELD, A., "Oil gas." June 19.
14,200.—ROBIN, J. I., "Inverted burners." June 19.
14,201.—ROBIN, J. I., "Brackets and mantle supports." June 19.
14,202.—JAMES, C. B., "Support for incandescent lighting." June 19.
14,210.—GREENFIELD, J., "Coin-freed meters." June 20.
14,213.—BELLAMY, A. R., "Gas-engines." June 20.
14,239.—BOUCK, J., "Treatment of coal." June 20.
14,254.—PÖSCHL, A., "Inverted gas-lamps." June 20.
14,317.—THORP, T., "Bunsen burners." June 21.
14,320.—BIRCH, G., "Anti-vibrator." June 21.
14,341.—RIES, H., "Gas-retort furnaces." June 21.
14,348.—THWAITE, B. H., "Coal distillation." June 21.
14,371.—CARPENTER, C. C., "Distillation of coal." June 21.
14,398.—M'GILLIVRAY, J., "Incandescent burners." June 22.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Tar for Roads and Workmen's Compensation.

SIR,—May I, through the "JOURNAL," congratulate my friend, Mr. Hunt, and with him all who helped to make the Dublin meeting of the Institution of Gas Engineers such a great success from every point of view? There were many questions of great interest discussed at the meeting—two of which call for a word from me.

First, as to tar. Mr. Maybury said that, through me, he was "able to obtain supplies for use in his county [Kent] at the low price of 1d. per gallon," *plus* freightage. These are the facts. The South Suburban Gas Company recently asked for tenders for their tar for a year. The offers varied slightly in amount; but the two highest were 17s. 6d. per ton, or about 1d. per gallon. One was from a tar distiller (several distillers tendered, but this was the highest), the other, at the same price, was from a railway company for burning in their locomotives. This, in fact, is what tar has come to, a rock-bottom price—viz., its value as fuel. Under these circumstances, the Board agreed to sell for road purposes at the same price; and this seems to me to be fair and reasonable. We badly want to reduce the quantity of tar we have to sell for distilling. It is, therefore, greatly to the interest of the gas industry to cultivate another promising market, and to sell for road-making at the price we get under contract from the distillers.

Now as to workmen's compensation. This important question, so opportunely introduced by Mr. Stafford Ellery, can be dealt with in a vastly better way than by insurance, excepting perhaps very small companies—better for the men, better for the company; for unless it were so for both it would not be advocated by me.

The South Metropolitan and the South Suburban Gas Companies have now had—the former ten years and the latter five years'—experience of contracting-out of the Act by means of Mutual Accident Funds. I believe the premium charged by insurance companies under the old Act was from about 8s. to 10s. per cent. on wages; and it is said they are now asking 17s. 6d. per cent. under the new Act.

Compensation for all accidents—including the first fortnight, with medical attendance and pensions to the widows of men who lost their lives in the Company's service, all on a more liberal scale than the Act required—cost the Mutual Accident Fund of the South Metropolitan Company last year £1435 for 6079 men, whose wages average 33s. 1d. per week. This works out to 4s. 9d. per man, or 5s. 6d. per cent. on their wages per annum. The new Act will add slightly to the cost, but certainly not more than 1s. 6d. per cent.; and at this rate it will be considerably less than half that of insurance.

This is not the result of an isolated year. The previous year was about the same; and the experience of the South Suburban Company confirms it.

How is it done? Simply by the principle of co-partnership, whereby employers and employed are united in friendly association for the prevention of accidents, which is infinitely better than compensation. The system has effected a great reduction in the percentage of accidents to the men employed, which is only half that of ten years ago.

We are now preparing a new scheme under the new Act, which shall be sent to you when settled. In the meantime, full information will be gladly given to any of our brethren interested in the subject on application to either Company.

GEORGE LIVESEY.

June 28, 1907.

Mr. Lyne on Mr. Tooms's Gas Institution Paper.

SIR,—The report appearing in the "JOURNAL" of the 25th inst. of the few remarks made by me on Mr. Tooms's paper at the recent meeting of the Institution of Gas Engineers is, I beg leave to say, not quite correct. This inaccuracy is not to be attributed to your reporter; but rather to the fact that I did not speak sufficiently loud, and also to the fact that I was needlessly interrupted. I say needlessly, because I consider that I was quite within my rights in controverting some of the unproved statements of the writer of the paper; and any explanation of the meaning which Mr. Tooms wished to be attached to his words, or of the points which he desired to be conveyed (though not divulged in plain English), might have reasonably been deferred until I had concluded, if the object had not been to intercept the trend of my thought, which, let me hope, was not the case.

Mr. Tooms argued, for instance, that the increased consumption of gas depended more on the out-door service rendered to customers than on the price per 1000 cubic feet at which it is sold. This was his contention; but he made no effort to prove it. While not wishing to decry some of the methods advocated in the paper, I was prepared to show that price has a strong determining influence in increasing or lessening the consumption of gas. Take, for instance, the group of towns in Table I. of the paper:—

	Cubic Feet.
Waterford, with a price of 3s. 9d., has a make per head of	3033
Tipperary, price 4s. 11¾d., make per head	2419
Kilkenny, price 5s., make per head	2167
Fermoy, price 5s. 2½d., make per head	1411
Mallow, price 5s. 8d., make per head	1168

And so on. Secondly, by comparing Waterford itself with towns where the price of gas is lower than at Waterford.

	Cubic Feet.
Belfast, price 2s. 3d., less discount, make per head	5487
Bangor, price 3s. 6d., less discount, make per head	5007
Dublin, price 3s. 4d., make per head	4100
Wexford, price 2s. 9d., make per head	3689
Cork, price 3s. 4d., make per head	3402
Waterford, price 3s. 9d., make per head	3033

Without going any farther, I think this proves clearly the influence a moderate price has in increasing the quantity of gas used; and be it noted that some of the towns named above, which sell gas at a lower price than Waterford, are of less importance, and have smaller populations. Permit me to say here that I did not state that Mallow and Middleton came immediately after Portadown in cubic feet of gas per head. Far from it. But I did say that Middleton, with only 3361 of population, had a larger consumption per head than Mallow, with a population of 4452. Mallow is a much more important town than Middleton. The make of gas per head in Middleton is 1725 cubic feet, and in Mallow 1168 cubic feet. Both towns are in County Cork, and within a very short distance of each other. The price of gas at Middleton is only 4s. 7d. per 1000 cubic feet; at Mallow it is 5s. 8d.—one more instance of the good effect of a reasonable price. So far as I know, there has been no extra pushing in Middleton; but it is reasonable to assume that the managers of the Middleton gas undertaking have been attending to their duty and are alive to the interest of their customers. Other towns in the group mentioned in Table I. of the paper compare unfavourably in price and in cubic feet of gas per head with towns of similar size not named in the same table, and not very far away from them. It is not necessary that I should trouble you or your readers with the figures.

As I said at the meeting, the inference to be drawn from the paper is that no other towns in Ireland were making anything like the progress of those mentioned in Table I.; that the managers of those undertakings took little or no interest in increasing the sale of gas, and that they did not care to arouse the attention of their customers to the advantages to be derived from using incandescent burners.

I cannot say from my own knowledge what has been done by numerous towns not named in Table I.; but I feel pretty certain, from the figures I have given above, and from others I have studied, that they are doing their duty. I can say for the town from which I write that the increase in the consumption of gas has been brought nearly to a standstill from the large number of incandescent burners that have been fixed during the last few years. Fortunately, another source of consumption has been tapped which is certain to stay, and which is being developed very steadily.

Before closing this letter, I would remind readers of it that we had this group of small Irish towns before the Institution meeting last year in another form; and they appeared, according to the report in your columns, before the Irish Association meeting held in Dublin last year in still another form. We have had them at the recent meeting; and I should not be surprised if we hear more about them at the Institution meeting to be held in London next year. No doubt all this must be very instructive to the members of the Institution of Gas Engineers, and I suppose we cannot have too much of it!

J. LYNE.

Wexford, June 29, 1907.

Mr. Copp's Institution Paper.

SIR,—With reference to my Institution paper, on "Incandescent Gas Lighting," I much appreciate your excellent report, and also the manner in which you have reproduced the illustrations. But I would point out that the numbers of the illustrations have in some way been altered, so that the results of the tests, and the remarks in the appendix relating thereto, are totally inapplicable, and, unless corrected, I am afraid will lead me into serious difficulty. The numbering should have been the same as in the advance copy printed for the Institution meeting; and, in order to prevent misapprehension, I think that it would be as well if you would make the correction in the next issue of the "JOURNAL."

I may add that the reason the illustrations corresponding with some of the numbers were omitted, is that these burners are either familiar to everyone, or that their construction does not involve any features of special interest.

HAROLD E. COPP.

West Bromwich, June 27, 1907.

[In accordance with our correspondent's intimation, it may be mentioned that figs. 1 to 8 of Drawing No. 1 (p. 963) should have been numbered figs. 1, 3, 4, 5, 6, 7, 8, and 10; that figs. 1 to 5 of Drawing No. 2 (p. 964) should have been figs. 1, 2, 3, 5, and 6; and that figs. 1 and 2 of Drawing No. 3 (p. 965) should have been Nos. 6 and 7.—ED. J.G.L.]

Protecting Meter-Couplings.

SIR,—We have been interested to read the letter of Mr. Cox in the last number of the "JOURNAL." We enclose for your perusal a copy of Mr. Cox's complete specification and one of our own, by which you will see the different nature of the two inventions.

Mr. Cox's claim, as described in his specification, is for a protective appliance for pipe connections and fittings and for other purposes, consisting of a two-part hinged casing tapped at one end to receive a form of screwed locking-pin having threads of different diameters running in different directions. Our invention is for an appliance to prevent tampering with the unions of gas-meters, consisting of two half-circle troughs having holed lugs at their ends; the two halves being joined together by lead eyelets similar to those used in our patent sealed padlock for prepayment meters.

We would not presume to compare the merits of the two inventions, but beg to point out that the idea of protecting the unions of gas-meters is a very old one; and we enclose you a copy of a specification taken out in 1879 by Mr. G. F. L. Foulger for protecting these unions.

THOMAS GLOVER AND CO., LIMITED,
Per THOMAS GLOVER.

Gothic Works, Upper Edmonton, N., June 28, 1907.

Visits of English Engineers to Foreign Works.

SIR,—In a reference published in various technical journals to a recent visit paid by the members of the Society of Engineers to the new reservoirs being constructed at Honor Oak for the Metropolitan Water Board, it is stated that these will contain nearly 60 million gallons of water, and that they will probably be the largest covered reservoirs in the world. Such a statement proves very conclusively the value of visits to large and notable works, especially when such visits are extended to

countries other than our own—an opinion recently stated publicly by Mr. Brodie, the Borough Engineer of Liverpool, in connection with the visit there of the Association of Municipal and County Engineers.

My purpose in calling the attention of your readers to the above matter is to point out that the recent visit of the Association of Water Engineers to Paris brought home to the members the fact that in the year 1900 a covered reservoir was carried out by the Municipality of Paris, at St. Cloud, which has a capacity of 66 million gallons, or 10 per cent. more than that of the Honor Oak reservoirs; and the statement I have quoted seems to emphasize the necessity for engineers to acquaint themselves with the work of our Continental neighbours before making or accepting statements which a fuller knowledge would prove to be unwarranted.

In many other respects than that above mentioned, the recent visit of the Association of Water Engineers to Paris has proved of unusual interest and value. The general use of an independent supply of unfiltered water for municipal and trade purposes, the construction of sewers providing accommodation for water-mains, pneumatic tubes, telegraph and telephone cables, &c., as well as discharging the ordinary functions of sewers, the free use of armoured concrete in water-works and other engineering structures, are examples of French practice which, whether suitable for imitation in this country or not, should be studied by all English engineers who claim experience as well as ability.

In the filtration of potable water supplies, our neighbours, once so far behind the standard of practice in England, have now advanced until it is our turn to learn from them. The decision of the Derwent Valley Water Board (acting under the advice of their Engineer, Mr. Edward Sandeman, M.Inst.C.E.) to adopt the Puech system of filtration, which is now almost universally applied to the river water supplied for potable purposes by the Municipality of Paris, is an excellent illustration and a definite proof of this statement.

Difficult and costly though it be for engineers to qualify themselves in the manner I have indicated, still the organization of foreign tours such as the Water Engineers have carried through successfully on two occasions affords a splendid opportunity of acquiring such experience at a minimum of trouble and expense; and I think your readers will be well advised to encourage and support every effort of the kind that may be brought under their notice.

EASTON DEVONSHIRE.

Chislehurst, June 27, 1907.

LEGAL INTELLIGENCE.

ALLEGED GAS POISONING IN GLASGOW.

In the Court of Session last Tuesday, Lord GUTHRIE heard Counsel in the adjustment of issues for trial by jury of the action, reported last week (p. 1009), in which Edward and Mrs. M'Andrew and Mrs. Convery, residing at No. 12, Carbeth Street, Glasgow, sue the Corporation of Glasgow for damages in respect of poisoning by gas.

Mr. A. CRAWFORD, for the defenders, moved his Lordship to dismiss the action as irrelevant. Gas, he said, was not used in any of the rooms in the tenement; and, on the pursuers' own showing, the gas-main was laid about 6 feet from the building. There was no specific averment that the main was laid in a coup or toom. It was said that defenders failed to inspect the pipe; but such failure would not have caused the accident. There was no proper averment of damage sustained. It was not stated in what way the pursuers suffered.

Mr. A. A. FRASER, for the pursuers, argued that it was the duty of the Corporation to have taken precautions against the corrosion of the pipe; but, he averred on record, they failed to do this, and thus caused the accident. His averments of corrosion and subsidence were sufficient. His theory was that the gas, being unable to find an escape upwards to the street, was driven down, and made its way into the tenement. Defenders admitted that precautions were necessary, because they said the pipe was coated with Dr. Smith's composition.

Mr. COOPER, K.C., replying for the Corporation, said that, as a matter of fact, they took up the pipe, and found that there was no corrosion. The Court never held that a corporation were bound to dig up the ground periodically to see if pipes were in order.

Lord GUTHRIE said there was one averment which was quite relevant—that with reference to Rose Ann Convery, who died on account of the escape of gas. The case, therefore, must go to trial. The record had been acutely criticized on behalf of the Corporation, and the criticism was by no means without substance; but a record of this kind was not to be dealt with as if it were a deed of entail. If there could be spelt out of it a relevant case, and if the defenders received sufficient notice of the case—which was the really practical question—the Court would not refuse to send it to trial. With regard to the pursuers' averments that there was a coup, and as to the failure to see that the pipe was actually leaking, he thought that while they lacked the precision they might have had, it was quite evident that the defenders knew exactly what the pursuers' case was, and understood it. With regard to the question of how the pipe was leaking, the defenders admitted that there was a fault in it, though they attributed it to an accident. Therefore it was enough when the pursuers said that the defenders laid a gas-pipe in a faulty and defective manner. With regard to corrosion, though it was by inference instead of by direct statement, they had it stated that if certain things had been done the fracture would have been prevented. He therefore thought that the objections could not be given effect to. It was admitted that the death of Rose Ann Convery was properly set out. With regard to the others, if they exhibited acute symptoms of poisoning by gas, and this was due to the action of the defenders, the defenders must pay. It might be that the pursuers would not recover the sums they sued for; but this was a question of expenses, and should not prevent the case going to trial. He therefore approved of the issues.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported: Broadstairs and St. Peter's Urban District Water Bill, Portishead District Water Bill.

Bill read the third time and passed: Colne Valley Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Colne Valley Water Bill.

Lords Bills read a second time and committed: Coventry Corporation Bill, Sheffield Corporation Bill, Tynemouth Corporation (Water) Bill.

Bills reported: Heywood and Middleton Water Board Bill [Lords], Metropolitan Water Board (Charges, &c.) Bill, Metropolitan Water Board (Various Powers) Bill, Wisbech Water Bill [Lords].

Lords Bills read the third time and passed: Birmingham Corporation Water Bill, St. Neot's Urban District Council Bill.

Petitions have been presented against the Birkenhead Corporation Water Bill [Lords], by the Liverpool Corporation, the Cheshire and Flintshire County Councils, the Chester, West Cheshire, and Wirral Water Companies, and the Dee Conservancy Board.

ANNFIELD PLAIN AND DISTRICT GAS BILL.

House of Lords Committee.—Wednesday, June 26.

(*Before the Earl of* DONOUGHMORE, *Chairman; the Earl of* ABINGDON, *Lord* HAMILTON OF DALZELL, *Lord* KENMORE, *and Lord* BOWES.)

The object of this Bill is to incorporate a Company with power to acquire and construct gas-works, and to manufacture and supply gas in the urban districts of Annfield Plain and Tanfield, in the County of Durham.

Mr. HONORATUS LLOYD, K.C., Mr. VESEY KNOX, K.C., and Mr. CLEASE represented the promoters (Messrs. Lees and Butterworth being the Parliamentary Agents); the Hon. J. D. FITZGERALD, K.C., and Mr. G. J. TALBOT, K.C., appeared in support of the petition of the Annfield Urban District Council (Messrs. Dyson and Co., Agents), who opposed the Bill.

Mr. VESEY KNOX, in the absence of Mr. Honoratus Lloyd, opened the case, and remarked that Annfield was situated in a colliery district, where the population had of late years been rapidly increasing. The area was 3489 acres, and the part of Tanfield (the adjoining district) which the promoters were taking, was roughly 4000 acres. There was no opposition to the Bill from Tanfield; but the Annfield Plain Urban District Council, who had opposed them in the House of Commons, again objected. The state of the gas supply in the district had not been very satisfactory up till now. He did not think it could be seriously disputed that some alteration was wanted, and that a company having statutory powers would be an improvement. In Tanfield and Annfield there were two separate gas-works. There were some works at West Kyo which were owned by the Annfield Plain Gas Company, and there were other works at Dipton which had private owners. In Tanfield, there were works owned under a partnership; and other works of which the owners were Messrs. James Joicey and Co., Limited. None of the owners of these works had statutory powers; and the position of a non-statutory gas company was, in many ways, an unsatisfactory one. Every time they opened the roads they committed an indictable offence; and they were under no obligation to furnish a supply of gas. However, Mr. Schultz and Mr. Comins visited the district and purchased the works at Dipton and West Kyo; the total outlay they had incurred being £9731. A main was laid connecting the two works, and other extensions were carried out, involving a cost of another £2400. But as soon as the Bill was deposited, the Local Authority put their veto on the laying of mains, and had apparently done everything they could to prevent the would-be consumers of gas from getting a supply. Messrs. Schultz and Comins had actually a list of 288 people who were asking for gas, and who were waiting for the Bill to be passed, for the veto of the Local Authority to be removed. There were other gentlemen, of good commercial position, who were associated with Messrs. Schultz and Comins, and were joint promoters of the Bill. There was an obvious objection to Messrs. Schultz and Comins themselves fixing the price to be paid for their works; and it had been thought that the most convenient plan would be to allow the figure to be determined by arbitration as between them and the new Company to be incorporated under the Bill. An agreement was made under which the owners were to sell and the Company were to purchase the property at a price to be settled by a single arbitrator; and the price was to be paid by the issue of fully-paid shares in the Company. It had been objected to this that the works were not worth what had been paid for them; and this seemed to be a reason for having an arbitration clause. When power was taken by the promoters to supply Tanfield, it was done because there were mains laid into it from Dipton; and it was thought that the district might fairly be included in the limits of supply. The House of Commons Committee, however, in giving their decision on the Bill, provided that Tanfield should be included, on the understanding that the Company in the North were communicated with, to see if they had any objection to raise before the Committee. It was found that Lord Joicey's Company did not desire to sell; and his interests had been entirely protected by an amendment

of the Bill, by which the promoters struck out of their limits the part of Tanfield supplied by Lord Joicey's Company. It was also provided that the Company should, within six months from the passing of the Bill, purchase from Messrs. Joicey and Co., and this firm should sell, the gas mains, pipes, and apparatus belonging to them in the part of the village of Whiteley Head which was within the boundary of the Annfield Plain urban district, at such a price as, failing agreement, should be settled by the arbitrator appointed under the Act; and the Company were also to pay to Messrs. Joicey and Co. such compensation in respect of the loss sustained by them by reason of their ceasing to supply gas to the 40 houses they supplied as should, failing agreement, be settled by the arbitrator. The price there now was 4s. 6d. per 1000 cubic feet, which was the price proposed under the Bill. The Burnopfield Company were quite willing to sell their undertaking; and Messrs. Schultz, Comins, and Co. had bought the works for £2350, in addition to a further sum for stores, to be fixed by valuation. The gas-holders would probably be left in their present positions on the old works; but there was no doubt that the manufacture of the gas could be most economically carried on at the central works at Dipton. With regard to financial considerations, the Committee of the other House had reduced the amount of the proposed capital; and now, by clause 7 of the Bill, it was to be £36,000. The borrowing powers granted were fixed at one-third of the total capital for the time being employed, making £12,000 as the maximum; thus giving a total of £48,000. The promoters would have to buy the existing works, and supply Tanfield as well as Annfield Plain; and the works would have to be developed. In clause 14 of the Bill, it was set forth that, except as by the Act provided, the profits of the Company to be divided among the shareholders in any year should not exceed 7 per cent. on the ordinary capital and 5 per cent. on the preference capital. By clause 38, the standard price was to be 4s. per 1000 cubic feet; but if they raised it 1d. beyond the 4s., the dividend would be reduced by 3s. 6d. So that if they raised the price 6d. per 1000 cubic feet, the dividend would fall 21s. per cent.; but if they reduced it, they might divide a larger dividend (if properly earned) than the standard. The price of gas at Dipton was 4s. 6d., and in Annfield it had been 3s. 9d.; so that in taking 4s. as the standard, they were going to the limit of safety.

Evidence was then given in support of the Bill.

Mr. *W. A. Schultz* stated that there was a considerable demand for gas in the district. His evidence referred chiefly to the amounts expended on the works.

Mr. *H. C. Walker*, one of the promoters of the Bill, gave evidence to the effect that he was prepared to invest considerable sums of money in the Annfield Plain Gas Company.

In reply to Mr. FITZGERALD, witness said he was aware that gas stocks were commonly bought and sold to pay less than 5 per cent. It was possible that, while Mr. Schultz had spent altogether £12,000 odd, the arbitrator might award him £20,000.

In reply to Mr. CLEASE, witness agreed that the award might be for only £5000.

Mr. *Edmund H. Stevenson* said he inspected part of the district in question. It had a growing population, and the property which was being built was of a better class. The consumption of gas was now estimated at about 10 million cubic feet per annum; but the works were capable of supplying a much larger quantity—there being three settings of seven retorts at Annfield Plain and two settings of five each at Dipton. There was a great desire for gas in the portions of Tanfield which were not yet served; and the main needed to connect up this district would be about a mile long and 6 inches diameter. The cost would be about £500. More than double the interest on this sum would be saved from shutting down the Busty Bank works, and supplying the gas from Dipton—in fact, the whole cost of wages and works and repairs at the northern works would be saved. He would bring the whole thing into one undertaking, and supply from a central station. At Annfield Plain there were 20 retorts. The purifiers were very small and old-fashioned; but new ones had been ordered. The gasholder capacity was also small; but the scrubber was quite sufficient for present purposes. The mains actually laid were some 8000 yards in length, and varying in diameter from 5 inches down to 3 inches. At Dipton there were 10 retorts; and, with the exception of the purifiers and the gasholder, everything was large enough. The output at the combined works he estimated at 125,000 cubic feet per day, or about 25 millions per annum. It was the intention of the promoters to have two new purifiers 10 feet square at Annfield Plain, and two others at Dipton, with the idea in future of putting the whole four down at Dipton. By this means pure gas would be obtained and the cost of manufacture reduced. He considered that the price to be paid for the Burnopfield Gas Company's undertaking (£2350) was very reasonable. The other undertakings were to be acquired by arbitration, and nothing could be fairer. Within a couple of years they would have taken up the whole output, which would amount to between 20 and 30 million cubic feet a year; and new works would then have to be constructed at Dipton. But he would not be surprised if, within another fifteen years, the output was 50 or 60 millions. The capital would last about twelve years. The standard price to be charged was a reasonable sum.

Mr. *H. E. Jones* said that no two gas-works, each on a scale of only about 5 million cubic feet per annum, which constituted small village gas-works, could be built for less than about £1000 or £1200 per million cubic feet of gas output. It had been reported to him that the sale of gas in the two undertakings was about 9 millions per annum; and the works to provide and convey this to the consumers' houses could not possibly exist or be brought into existence by an expenditure of less than close upon £10,000. When building large works, such as those in London, he spent £400 per million cubic feet; but when putting up medium-sized works, such as those at Eastbourne, Canterbury, or Faversham, he spent £600 per million. When he came to something like 10 or 12 millions, he did the work for £700 per million feet; and if he was providing for only 5 millions, it would take £1000 per million. If he were to go below 5 millions, it would cost £1200 per million as the bed-rock cost for putting in brickwork, gasholders, cast-iron mains in the streets, and service-pipes. If the slot-meter system were used, a heavier expenditure than the one he had given was demanded.

Rev. *Richard Tewson*, Vicar of Dipton, said that during his 24 years residence at that place he had experienced a great deal of trouble and inconvenience with regard to the supply of gas. In fact, a few years ago they had to go to the expense of buying lamps for the purpose of lighting the church. The supply frequently failed; and the quality of the gas was very poor. Since the new Company had taken over the works, there had, however, been considerable improvement both in quality and pressure. The Local Authority had not been very active in dealing with the matter; and until the opportunity had gone, they had not disturbed themselves.

Mr. *Redican*, Assistant Gas Engineer to the North-Eastern Railway, said the Company consumed 10 to 12 per cent. of the make of gas at Dipton and Annfield; their annual consumption being some 800,000 cubic feet. He agreed that the quality of the gas had much improved recently.

Mr. *M. M. Hobson*, a resident in the district of Tantobee and Annfield Plain, preferred that the gas undertaking should be in the hands of a statutory Company rather than in those of the Local Authority. He was a Director of the old Company; and when the undertaking was sold, they received £10 for their £5 shares. The last dividend they paid was 7½ per cent.; and they could have paid 15 per cent.

Mr. *Braidford*, a colliery manager of Tanfield, said there were 200 houses in his charge that required a gas supply; and the population of the area which was to be included under the Bill was over 4000.

Thursday, June 27.

Mr. *J. A. Castle*, a resident in the district, said his drapery establishment was formerly frequently plunged into darkness through failure of the gas supply; and, in consequence, he was compelled to light his premises with oil. Since the undertaking changed hands, matters had been considerably improved.

Mr. *C. L. Ireland*, the Manager of the Company, said the reason they were unable to supply gas was because they were not permitted to lay mains. They secured customers; but then they found they were unable to supply, because of the action of the Local Authority.

This concluded the case for the promoters.

Mr. *Corbet Woodall*, for the petitioners, said he had visited the district in which the works were situated. After the Bill was in the other House, it turned out that the districts of Tantobie and Tanfield were part of the area of an existing statutory undertaking; and they were thereupon abandoned. The works, when he saw them, were in a very deplorable condition. The maximum day's work done at Dipton—the maximum quantity of gas sent out from the station—was 18,300 cubic feet. The gasholder would only contain 9300 cubic feet. At Annfield Plain, the maximum quantity sent out was 46,000 cubic feet; and the holder capacity was 24,000 cubic feet. At Dipton, there was no washer, no scrubber, no exhauster, and only two purifiers; and under these conditions it was absolutely impossible the gas could be reasonably purified. The retorts at Annfield Plain were in ruins—practically falling to pieces; the purifiers were completely worn out; the connections were 4 inches in diameter, instead of about 6 or 8 inches; and there was no station meter. But apart from this, the whole condition of the place was deplorable, and completely neglected.

In reply to Mr. TALBOT, who drew attention to the fact that £10 was paid for each £5 share, and that one of the witnesses had spoken of a dividend of 15 per cent., witness remarked that the payment of dividends under such circumstances was foolish; and it was scandalous to leave the manufacturing plant in such a condition that they could not possibly supply reasonably good gas. The gas must have been deficient in quality; and to be paying dividends, was a thing that ought to have been unheard of. If provision was now made for trebling the output from the present works, he did not think it was a case in which the Company should be allowed such a large amount of capital as would keep them away from Parliament for a considerable time. The idea of doing away with the Annfield Plain station, and concentrating the works at Dipton, was a good one; and he considered that £6000 would fully cover the cost. If the dividend was to be 7 per cent., the standard price of gas ought to be 3s. per 1000 cubic feet; but if the dividend was to be 5 per cent., the standard might be 4s. It was provided that the remuneration of the Directors was not to exceed £250; but if the expenditure generally was to be upon the same scale, there would not be very much dividend to distribute. It was an absurdly extravagant amount.

Cross-examined by Mr. HONORATUS LLOYD, witness agreed it was desirable that the gas should be supplied under statutory powers of restrictions. There was no reason why the Company should not make gas and distribute it at a cost of 1s. 8d. per 1000 cubic feet; and if 1s. covered the dividend, this would make the delivered price 2s. 8d. In cases such as this, the capital allowed by Parliament was never supposed to include anything for goodwill or prospective profits.

Mr. TALBOT, in addressing the Committee on behalf of the Annfield Plain Urban District Council, said the effect of a Bill of this kind was to give the promoters a practical monopoly of the gas supply in the district. Parliament ought to look with far greater jealousy upon the capital arrangements of companies of this sort than upon those which merely invited the co-operation of the public in an adventure, and to see that the public should not be misled by false or fraudulent statements. Here the whole case was an attempt to oust the principles upon which Parliament ordinarily acted in what was a perfectly familiar proceeding—viz., the clothing with statutory powers of undertakings which had hitherto carried on the manufacture and sale of gas without parliamentary authority and merely by the goodwill of the district. There was no dispute between the parties with regard to these principles; but the effect of the Bill was that hereafter any non-statutory company had merely to obtain a purchaser, who would then fill the part of vendor to a new company, and the whole of these principles would go by the board. It was an absolute revolution in the principles which Parliament had hitherto observed in the conversion of non-statutory into statutory companies. There was no precedent, as was admitted, for the arbitration agreement. A capital of £30,000 was a most liberal allowance for the future requirements of the Company; and the £250 for Directors' fees was an unreasonable burden. They did not quarrel with the standard price, assuming that the standard rate of dividend was to be reduced to 5 per cent.

Mr. HONORATUS LLOYD, in replying on behalf of the promoters, said that all he desired in the way of capital was an amount which would enable them to carry on business for the usual twelve or fourteen years; and as to the standard price of 4s., in conjunction with the 7 per cent. standard dividend, he contended that this was not too high.

The Committee decided to allow the Bill to proceed. They were not disposed to make any alteration in the capital, Directors' remuneration, or standard price; but they were of opinion that the price paid by the Company to the present owners of the works should be the actual sum paid by them, *plus* the fair value of all improvements made by them since purchase—this amount to be ascertained by an independent arbitrator.

Mr. FITZGERALD: Might I ask if the Committee have come to a conclusion upon the question of what the standard dividend is to be? The standard price is 4s.

The CHAIRMAN: We wish that to be maintained.

Mr. FITZGERALD: The standard dividend in the Bill is 7 per cent.; and the question is whether it should be 7 per cent. or lower?

The CHAIRMAN: I do not think we wish to alter that.

Friday, June 28.

Some discussion took place to-day between Counsel as to the clause prepared by the promoters to carry out the decision of the Committee; and this was ultimately agreed to. The clause provided that—

The agreement made between the said Albert William Schultz and William Comins, hereinafter called the owners, of the one part and Herbert Thomas Martin of the other part, as set forth in the first schedule to this Act, is hereby confirmed and made binding on the owners and on the Company, as if the Company had been a party to such agreement, and the same had been sealed with their common seal. Provided always that, in regard to the purchase under the agreement set forth in the first part of the said first schedule, the following provision shall apply: (1) The purchase price shall be the total of the actual sums paid by the owners for the lands, gas-works, and property described in Article I. of the said last-mentioned agreement; and the cost and expenses of, and incident to, the acquisitions thereof, together with the fair value of all works executed by the owners since such acquisition, and such purchase price, shall be settled by a single arbitrator, to be appointed on the application of either party within three months after the passing of this Act, by the President of the Gas Institution, in accordance with the provisions of the Lands Clauses Acts.

METROPOLITAN WATER BOARD (CHARGES, &c.) BILL.

The Joint Select Committee of both Houses of Parliament, presided over by Lord CROSS, had this Bill (see Vol. XCVIII. pp. 464, 594, 822) again before them last Tuesday, and concluded consideration of it.

Mr. HONORATUS LLOYD, for the Water Board, asked for the insertion of the words "in the case of any supply exceeding 25,000 gallons;" the object being that as other provisos enacted that there should be a minimum of 25s. per quarter charged, unless they put in these words the clause would have the effect of destroying the 25s. minimum.

Mr. MORTEN, on behalf of West Ham, said he objected to the clause as it stood, because the schools which took a supply of less than 25,000 gallons would not be entitled to any supply at all under the Bill. This was altered by the promoters, when they saw the difficulty, by saying they should have a minimum of 25s.; but in many of their schools they did not take 25,000 gallons a quarter. They objected to any provision which would make them pay for more than they took.

Mr. HONORATUS LLOYD said the 25s. minimum had been agreed; and they did not seek for a moment to disturb it.

Mr. HARPER also objected to the words, on the ground that they would create a conflict between certain sections of the Bill. Taking the case of a man who used 26,000 or 27,000 gallons; 26,000 gallons came out at £1 3s. 10d. on the 11d. scale, and 27,000 gallons came out at £1 4s. 9d. They were not entitled to charge him more; but he had to pay a minimum of 25s., and the two things did not appear to fit. It seemed desirable to leave the clause as it was.

The CHAIRMAN, after further argument, said the Committee thought the proposed amendment was right; and it was inserted.

The following Treasury clause was inserted, dealing with charges for supply to Government buildings:—

If, in relation to the charge made, or proposed to be made, by the Board for a supply of water, either for domestic purposes or for purposes other than domestic, to any building for the time being in the occupation of His Majesty, or of any department of His Majesty's Government for public purposes, any question shall arise between the person or department having the control of such building or requiring such supply on the one hand, and the Board on the other hand, as to whether the Board are for the time being furnishing in like circumstances to any other building within the limits of supply for the like purposes as those in respect of which such question arises, a supply of water at a lower rate of charge than the charge so made or proposed to be made by the Board, such question shall be determined by an arbitrator to be agreed upon between the parties to such question, or, failing such agreement, to be appointed on the application of either of such parties by the President of the Institution of Civil Engineers, and subject to the foregoing provisions of this section the provisions of the "Arbitration Act, 1899," shall apply to such determination.

The following Treasury clause was also inserted:—

The rate for the supply by the Board of water for watering any of the Royal parks or gardens situate within the limits of supply and maintained out of the public funds, and the roads in any such parks and gardens, shall, notwithstanding any other provision of this Act, be the fixed rate of 6d. per 1000 gallons.

The preamble of the Bill was then declared proved.

The Action by Messrs. Gibbons Bros.—In this action, which was reported last week (p. 1008), liberty to appeal has been granted by Mr. Justice Grantham, on condition that the defendants pay into Court the money sued for, together with the costs. His Lordship thought that it would be better for the legal points raised in the case to be argued before the Court of Appeal than before him, as he had perused all the authorities cited, and considered the points were for a higher Court.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

As stated shortly in the last number of the "JOURNAL," the accounts of the Edinburgh and Leith Gas Commission for the year 1906-7 were laid upon the table at a meeting of the Commissioners on Monday, the 24th ult.—Provost MACKIE, of Leith, presiding.

Mr. John S. Gibb, the Treasurer, in submitting them, pointed out that the accounts were subject to audit. He also presented a note, which, he said, brought out, in a few words, the exact position of affairs. It was as follows:—

The balance carried to the profit and loss account on the year's working is		£102,120
There has been paid during the year—		
For Edinburgh and Leith annuities	£31,758	
,, Edinburgh-Portobello annuities	1,070	
,, Amount transferred to sinking fund in respect of annuities redeemed	2,372	
,, Do. in respect of mortgages redeemed	637	
,, Interest on mortgages, &c.	42,083	
,, Expenses of mortgages	910	
		78,830
Showing a net balance on the year's working of		£23,290
From this falls to be deducted the debit balance for the year to May 15, 1906 (after meeting the sinking funds contributions for that year)		406
Making the sum at the credit of the profit and loss account		£22,884
As compared with £18,898 for the previous year.		
This is subject to the statutory minimum charges for the sinking funds, as follows:—		
(1) For repayment of money borrowed (20s. per cent.)	£11,918	
(2) For redemption of annuities (15s. per cent.)	6,944	
(3) For reserve fund (Commissioners' Gas Order, 1902, sec. 9), ¼ per cent. on £444,228	1,110	
		19,972
Which leaves a balance of at the credit of the profit and loss account, to be carried forward to next year.		£2,912

Under the "Law Expenses" and "Accidental Damages" accounts, provision has been made to meet Lord Ardwall's decision in the brewery well case.

The gas sold has been 86 million cubic feet more than last year; and the revenue from gas is greater by £11,769. The return from residual products has also been larger by £5752 than last year.

The present value of 1d. per 1000 cubic feet is £7952 5s. 9d.

On the motion of the CHAIRMAN, who expressed gratification at the result of the year's working, the accounts were remitted to the Finance and Law Committee to be dealt with.

The CHAIRMAN said that, as the Commissioners were aware, they delayed the settlement of their coal contracts, as they were of opinion that the market might become somewhat easier. He thought they should not delay further, because it was getting on in the season. They should advertise at once, and secure what they required for the coming year.

This was agreed to.

The accounts show that the stock capital, which originally stood at £370,000, with annuities to the amount of £35,200 payable thereon, has been reduced to £344,518 by the redemption of annuities, of which £103 of annuities were redeemed last year, at a cost of £1061. The loan capital authorized amounts to £1,400,000. There has been raised, by mortgage, £994,418, and borrowed upon deposit receipt £197,393; making together £1,191,811. Mortgages of £52,417 have been redeemed out of sinking fund, which has the effect of cancelling borrowing powers to this amount. That sum added to the mortgages and the amount in the deposit receipts, raises the loan capital to £1,244,228, and leaves a balance of borrowing powers of £155,771. The loan capital was increased during the year by £117,272. The capital expenditure amounted to £83,276, of which £72,784 was in connection with the Granton works, £5102 upon main and service pipes and the cost of laying, £1679 upon gas-meters, £2587 upon heritable properties not embraced in the works, and £1123 upon cooking and heating stoves. The capital expenditure was £16,617 less than the previous year.

The total revenue amounted to £325,222; being £17,647 above that of the preceding year, and £16,369 above the estimate adopted in September last. The quantity of gas sold was 1,931,301,000 cubic feet, or an increase of 86,141,100 cubic feet. The revenue from gas was £265,181, an increase of £11,769; from coke £24,632, an increase of £5748; from tar £13,412, a decrease of £580; and from sulphate of ammonia £21,145, an increase of £584.

The total expenditure was £223,102; being £6875 more than in 1905-6, and £9330 more than the estimate. The coal carbonized was 178,524 tons; being an increase of 7226 tons upon the previous year, and of 3524 tons upon the estimate. The cost of coal was £104,000, an increase of £168, but less than the estimate by £513. Oil for carburetted water gas cost £2800, a decrease of £475 upon the year, and of £983 upon the estimate. Salaries and wages amounted to £25,372, an increase of £2186 upon the year. Purifying materials and wages of purifier men came to £1851, a decrease of £64. Repairs and maintenance of works and plant, tools and implements, and dismantling old works, cost £24,254, a decrease of £1214. The total cost of the manufacture of gas was £158,278, an increase of £3030 upon the year, and of £384 upon the estimate. Distribution of gas cost £24,936, an increase of £348 upon the year, and of £850 upon the estimate; it being

almost entirely upon the repair and maintenance of meters. Management cost £10,654, an increase of £436 upon the year, and of £104 upon the estimate. Feu-duties, rents, rates, and taxes amounted to £15,118; being a decrease of £1301 upon the year, and of £482 upon the estimate. Pensions and allowances were paid to the amount of £1541, a decrease of £246 upon the year, and of £159 upon the estimate. Accidental damages, £3770 (the amount of the award in the well case), were up by £3727; and law and parliamentary charges £1891, were also up by £125 due to the same litigation. Discounts, abatements, and bad debts amounted to £6912, an increase of £756.

The sinking funds amount to £169,485, of which £165,770 is invested over heritable properties, and £3715 is lying in the bank on deposit receipt. These funds are less than they were a year ago by £6833; the charges being now heavier upon them on account of the increase of capital. The sinking fund for the repayment of money borrowed stands at £33,790; and that for the redemption of annuities at £135,695. The reserve fund—£7839—was increased during the year by £1170. The fund is now in the bank, on deposit receipt; whereas a year ago it was invested in mortgages over heritable properties.

Gas-stoves were purchased during the year to the amount of £2517, which was £455 more than was expended for the purpose in the preceding year. The expenses incurred in repairing and fitting up stoves amounted to £3474, a decrease of £341. The amount received for the hire of stoves was £1763, a decrease of £1700, which was due to the reduction by the Commissioners in July last of the rates for hire. For stoves sold, there was realized a sum of £1473, an increase of £125. For the fitting up of gas-fires there was received £603, an increase of £110. The proportion of fittings charged to the revenue account was £1029, or £12 less than before. The total expenditure on stoves and on repairing and fitting was £5991; and the total receipts for hires, sales, and fittings up was £3839. If to this sum is added the £1029 (the proportion of fittings charged to revenue account), the total revenue is brought up to £4868, which is less than the outlay by £1123, which again exactly corresponds with the amount by which the stock of stoves, &c., on hand or lent on hire, at the 15th of May exceeds in value that stated at the corresponding period of last year.

ANNUAL GAS REPORTS AT NOTTINGHAM.

Reports have been prepared for submission to the City Council by the Nottingham Gas Committee and Mr. J. H. Brown, the Engineer and Manager, on the working of the undertaking during the twelve months to March 31.

The Committee's Report.

In their report, the Gas Committee state that the quantity of gas sold during the year was 1,927,953,600 cubic feet, against 1,917,696,300 cubic feet in the previous year; being an increase of 10,257,300 cubic feet. The total income for the year amounted to £325,235, and the expenditure to £219,483, leaving a balance carried to the profit and loss account of £105,752. After deducting the interest, annuities, and sinking funds, and placing £2000 to depreciation of stoves, there remained a net profit of £50,303 at the disposal of the Council. Of this sum, £27,000 was to be handed over to the Finance Committee, by order of the Council, in aid of the general district rate; and the Committee recommended that the balance of £23,303 be disposed of as follows: £3000 to the depreciation fund, and the balance, £20,303, to the reserve fund and to meet the extra expenditure during the current year for repairs to the works and plant. Repairs estimated to cost £8000 had been already passed by the Committee for the Eastcroft works; and others were also being carried out at the Basford and Radford works that were estimated to cost £8000 and £2000 respectively.

The Gas Engineer's Report.

In his report, Mr. J. H. Brown, the Engineer and Manager, said that the reconstruction of the retorts in No. 1 retort-house at Eastcroft, which was to have been undertaken early in 1906, had now been commenced; and half of the house would be ready for work during the coming winter. The remaining half was being temporarily repaired until next spring. The new settings in the inclined retort-house were put to work last autumn, and had given very great satisfaction. The emergency value of this new plant had been of very special value during the past winter. The remainder of the work required to be done in the house was commenced this spring, and was nearing completion. At the Basford works, the new (fourth) section in the No. 3 house was put in operation last autumn, and had now had more than six months' continuous work. The results obtained had been very satisfactory. The new design was a considerable advance on the other three sections. The No. 1 and No. 2 sections in this house, which were to have been rebuilt in the spring of 1906, owing to delay had had to be reset with new retorts and repaired. The retort-beds in No. 1 and No. 2 houses were being repaired and refurnaced where necessary. This plant was not of modern design, but gave satisfactory results for the short period it was usually required to work during the winter months. The erection of the water-gas plant was finished early last year; but it had not yet completed its trial runs. It was most desirable that this plant should be thoroughly tested and made ready for efficient work in case of emergency. At the Radford works, the carbonizing plant was rapidly nearing the end of its useful life. For many years past, it had been used solely for work during mid-winter, or in case of emergency. So long as the existing plant was capable of giving fairly satisfactory results for the short period it was required to work, it would not be desirable or economical to incur the increased charges for interest on capital which would be involved by the substitution of new and modern plant. If allowance were made for the increased efficiency of the modern plant, such an expenditure could not even then be justified. The existing retorts were being repaired and made ready for the coming winter. The amount shown in the accounts for repairs and maintenance of works, &c., for the year was £34,243. The expenditure under this head had been above the normal for the past five years; and though a reduction was made last year, the sum shown in the accounts (which included £3000 in anticipation of next year's expenditure) was equivalent to 4¼d. per 1000 cubic feet of gas sold.

The reorganization of the distribution system, which was first commenced in 1903, was practically completed last autumn. During the past winter, the whole of the gas area was divided into sections, each works supplying its own district. A great improvement had been effected, and better and more efficient control could now be maintained on the pressure of gas throughout the whole of the city area. The department continued to suffer considerable loss from leakage, owing to the scattered nature of the area supplied. Substantial improvement was shown in the first three quarters of the past year; but this had been more than counterbalanced by the last quarter. The loss was largely due to subsidences which took place after the wet season.

The coke available for sale per ton of coal carbonized showed an increase of ¾ cwt. (or 6962 tons). This saving was largely due to the better working of the new settings and the carbonizing plant generally. Owing, however, to the fall in the value of coke during 1906, the net receipts were only £717 more. The tar-plant had been kept in an efficient state of repair, and a larger quantity had been distilled than in any previous year; the receipts being £2527 more than in the previous year. The sulphuric acid plant had been maintained in good working condition, and satisfactory results obtained during the past year's working. The sulphate of ammonia plant at Basford had manufactured more sulphate than in any previous year; but unfortunately, owing to the reduced value of the sulphate, the receipts were less by £463.

The increase of 0·53 per cent. in the quantity of gas sold was very satisfactory in view of the rapidly extended use of incandescent gas-burners. This was again evidenced by the result shown by the Public Lighting Department. Notwithstanding the constant increase in the number of public lamps, the consumption of gas had shown a regular decrease during the last five years, owing to the introduction of the incandescent system of lighting; but now that the system was practically universal throughout the district, a slight increase was shown in the consumption. The figures were sufficient to demonstrate the economical advantage derived from the incandescent burner; and doubtless but for the general introduction of these burners, the output of gas during the past few years would have shown a very considerable increase. In the past year, the difficulty experienced in the application of incandescent lighting to lace machines had been satisfactorily overcome; and there were at least three factories where this system was being applied with exceedingly satisfactory results.

During the year, 189,576 tons of coal had been carbonized, yielding 2,050,625,000 cubic feet of gas. The number of cubic feet of gas sold per ton of coal was 10,170. Carbonizing costs per 1000 cubic feet of gas sold had increased from 2·67d. in 1906 to 3·01d. in 1907; the increase being largely due to the additional cost of manufacturing a higher candle-power gas. The amount paid for rates and taxes (£16,835) showed a further increase of £1033. The previous year was an increase of £1130 as compared with 1905.

The amount of gross profit each year from 1902 was as follows:—

1902	£75,907
1903	89,141
1904	97,037
1905	91,941
1906	101,221
1907	105,752

Special attention was called to the average price obtained per 1000 cubic feet of gas sold, which had risen in the past year to 2s. 6·05d. from 2s. 5·82d. in 1906. The same prices for gas were in operation during 1907 as in 1906. The rise in the average price obtained, of 0·23d. per 1000 cubic feet of gas sold, was due to the increased proportion of prepayment meters, which now consumed nearly 300 million cubic feet of gas—an increase of about 30 millions for the year. The price to prepayment meter consumers included a further charge of 10d. per 1000 cubic feet for the rent of meter and cooker, and for the increased cost of the service generally. The average price per 1000 cubic feet of gas sold, after deducting this extra charge for rent, was 2s. 4·5d. The number of complaints received during the year (excluding those due to deposits of naphthalene) was 25·96 per cent., against 27 86 per cent. in the previous year.

The total mileage of mains was 364·88. There had been 8·01 miles added to the canalization during the year. The number of meters fixed at March 31 (including 453 lamp-meters) was 66,845; being an increase of 3106 on the previous year. The demand continued for prepayment or "penny-in-the-slot" meters. At the end of the financial year, 26,623 of these meters were in operation; an increase of 2870 on the previous year. The application of gas for trade and domestic purposes, other than for lighting, continued to increase. There were at present in use: Gas cooking-stoves, about 27,663; gas-fires, about 13,033; gas-engines, about 663; and a very large number of other appliances of almost every description, which had not been numbered. Of the 27,663 cookers in use, 9630 were rented from the department, and 17,331 were supplied with automatic meters rent free.

COVENTRY CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The detailed statement of the Gas Committee of the Coventry City Council, relative to the working of the Gas Department in the year ended the 31st of March, has been issued. The total borrowing powers exercised since the acquisition of the undertaking amount, with nominal additions, to £426,308, of which £31,340 has been repaid out of the sinking fund. The present liabilities are therefore £394,968. Against this the Corporation have reserve and sinking funds invested amounting to £42,278; leaving a balance of liability of £352,690. The amounts expended during the year on capital account were as follows: Structural works (Foleshill site), £18,638; new mains and services, £3600; new meters, £1819—total, £24,057. The total capital expenditure since the acquisition of the undertaking, including the original purchase-money, amounts to £354,236. The balance of capital

in hand is £72,071. The total revenue for the year from all sources amounted to £119,309; and the expenditure to £99,014. This leaves a gross profit of £20,295, to which has to be added the amount carried forward from last year and the interest allowed by the bank and the Barnsley Corporation—making a total of £22,919. Against this are capital and other charges amounting to £19,427—leaving a final balance of £3492. The amount of the reserve fund is at present £9665. With regard to the disposal of the profit balance, the Committee recommend that £2000 should be paid over to the district fund, and the remainder (£1492) carried forward.

OLDHAM CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The General Manager of the Oldham Corporation Gas Department (Mr. Arthur Andrew) has prepared his customary report on the working for the year ending the 25th of March.

The total expenditure on capital account in the twelve months reported upon was £6232; the largest amount (£4079) being at Hollinwood. The gross revenue amounted to £167,772, and the gross expenditure to £130,518; the balance carried to the profit and loss account being £37,254. Deducting from this the annuities during the year (£3378), interest on loans and stock (£12,875), and sums payable to the respective sinking funds (£4512), there is a net profit of £16,489. Adding the balance brought forward and one year's accrued interest from the annuity redemption fund, and deducting the amount to which the Corporation are entitled in aid of the borough fund (£8515), and £8000 for the reserve fund, the credit balance to be carried forward is £14,507. The gross profit is £3502 less than that of the previous year. This is entirely due to the reduced price charged for gas since June 25, 1906, and to the cost and maintenance of consumers' meters, which is now borne by the department, instead of by the owners as formerly. The average price realized for coke was nearly 3d. per ton more than in the previous year; and on tar there was a gain of 4¾d. per ton. A slightly less price was received for ammoniacal liquor. On the expenditure side of the revenue account, the cost of coal, oil, &c., was rather less than in the preceding year. The amount expended under the head of mains and maintenance of works and plant has increased to the extent of £1232. Carbonizing wages have, however, decreased by £1279, though 5497 tons more coal were carbonized. This saving is due to the more extended use of stoking machinery. A sum of £580 has been paid in respect of compensation to injured workmen. This is quite exceptional, and is much larger than in any previous year. Taking an average of years, the policy pursued, of accepting the risk without insuring, has been an economical one. The cost of fixing cookers free during the year amounted to £1177. The average price realized for gas sold, including gratuitous lights, during the year was 23·67d. per 1000 cubic feet. This is the first time the figure has fallen below 2s. A sum of £1500 has been transferred from the reserve fund to the credit of capital account for depreciation of cooking-stoves. The amount in the reserve fund on March 25 was £48,986.

The quantity of gas supplied to the corporate street-lamps and municipal buildings free of cost during the year was 83,871,000 cubic feet. There were 59 additional lamps erected within the municipal borough, and 22 in the out-townships. The total number of lamps fixed in the supply district on the 25th of March was 5436. The total number of incandescent lamps at that date was 1638 within the borough, and 514 in the out-townships; being an increase of 417. Automatic controllers have now been in operation for over twelve months on 109 lamps; and so far they have proved very satisfactory. The quantity of gas manufactured at the different stations during the year was: Oldham, 99,211,000 cubic feet; Higginshaw, 697,549,000 cubic feet; Hollinwood, 458,017,000 cubic feet, ditto (water-gas plant) 109,749,000 cubic feet; Royton, 49,439,000 cubic feet—total 1,413,965,000 cubic feet, against 1,318,944,000 cubic feet in the preceding year, being an increase of 94,571,000 cubic feet, or 7·2 per cent. The quantity of coal carbonized was 115,867 tons; and 369,453 gallons of oil and 62,146 gallons of benzol were used in gas production. The average quantity of coal gas made per ton of coal carbonized was 11,256 cubic feet, compared with 11,010 cubic feet in the previous year. The loss of gas from leakage, &c., was 80 550,000 cubic feet, or 5·69 per cent. of the quantity made, compared with 5·82 per cent.

The total number of meters fixed on the 25th of March was 50,723, of which 1068 are of the prepayment type. There were 547 meters fixed in new premises and others in which gas had not previously been used; and 583 meters were disconnected and the services taken out where gas is not likely to be required in the future. The actual number of consumers on March 25 was 44,862. The number of additional cooking-stoves and grillers fixed during the year free of charge to consumers was 1333. The total number in use on the 25th of March was 10,575. During the year 44 gas-fires, &c., were sold.

The increase in the quantity of gas consumed by private consumers, excluding gratuitous lights, was 87,139,000 cubic feet, of which there was consumed in houses and shops 46,670,000 cubic feet, and 40,469,000 cubic feet in mills and works; the greatest increase in the last-named being in machine shops and kindred trades. There was, however, a substantial increase in the quantity consumed in the textile mills. Previously there had been a decrease in the consumption in this class of property, owing to the extension of the incandescent system of lighting and the installation of electricity. In order to supply the increasing consumption in the district of Royton, a 24-inch main is now being laid from Middleton Road, Chadderton, to Royton, which will suffice for the needs of the last-named township for many years to come. It is probable that the works at Royton will not be again utilized for the purpose of gas manufacture. A great amount of trouble and annoyance has been caused during the past year by the accumulation of naphthalene in the mains, service-pipes, and meters of consumers. Steps have, Mr. Andrew remarks, been taken, by the laying down of special plant, for the elimination of this troublesome substance from the gas during the process of manufacture; and it is confidently hoped that the means adopted will prove successful.

Contracts have been entered into during the year for replacing a further number of old retort-settings at the Hollinwood station with others on the regenerative principle, and also for extending the plant for charging and drawing by machinery, and for the automatic conveyance and storing of coke. A plot of land has been acquired at Hollinwood, within the Oldham boundary, on which to erect an additional gasholder; the largely increasing requirements of the district necessitating increased storage accommodation.

SATISFACTORY RESULTS AT SKIPTON.

At the last meeting of the Skipton Urban District Council, the results of the past year's working of the gas undertaking were placed before the members.

The statement was made by the Chairman of the Gas Committee, Mr. Graham, who said that during the twelve months to March 31, 7702 tons of coal had been carbonized, as compared with 7394 tons in the previous year—an increase of 308 tons. The gas sold had been 77,484,000 cubic feet against 72,067,000 feet. There had thus been an increase of 5,417,000 feet, or 7 per cent. The make of gas per ton of coal had been 10,060 cubic feet, against 9746 feet. These matters were very satisfactory. Last year, in his statement, he spoke of the leakage, and the saving that had been effected since the Council took over the concern. He then announced that they need not expect any further economy in the way of leakage prevention, seeing that they had reduced the figure to 4·36 per cent. They had, however, done better; and the leakage had been reduced to 3·2 per cent. This was a remarkable achievement, having regard to the small size of the community with which they had to deal. Gas-rentals had increased £77, from £10,177 to £10,254. They must remember, moreover, that during the year they reduced the price of gas 2½d. per 1000 cubic feet to ordinary consumers and 3d. to slot-meter consumers. The growing popularity of the slot meter had been proved; and of these consumers during the year there had been an increase of 222. There had, however, been a decrease of 106 ordinary meter users; leaving the net increase in consumers for the year 116. During the year, 238 gas-cookers had been fixed, making the total number in use in the town 1033. It was reasonable to expect that, if in the near future there was to be a further reduction in the price of gas, it would be the result of people being encouraged to use more gas for cooking purposes. They must also bear in mind that this year the price of coal had gone up 6d. per ton—a fact that militated against their gross profits. The cost of coal, after deducting receipts for residuals, would work out on this occasion at 3s. 2d. per ton; and last year it was 2s. 11½d. per ton. The gross profit had been £5548, against £5697, a reduction of £149. The net profit for the past year was £950; and in the preceding year it was £1142. They had reason to congratulate themselves on the management and the result of the year's working; and congratulations were due to Mr. J. H. Woodall, the Engineer and Manager, and to his staff for the effort they had put forward and the success achieved. They were often hearing rumours about gas-works extensions. For his own part, he saw no necessity for extending. If they made the best use of their resources, they had ample plant to serve the purposes of the town for many years, unless they were faced with an extraordinary demand for gas.

THE YEAR'S WORKING AT SMETHWICK.

The Secretary's Report.

The Smethwick Town Council, at their meeting last Tuesday, had before them the accounts of the Gas Department; and they approved of the Committee's recommendation that £2000 should be allocated in relief of the general district rate, £1000 be paid as the second instalment of their contribution of £5000 towards the cost of the new Council House, and £5961 be carried to the depreciation and suspense account.

In his report upon the accounts (which are for the year to March 31), Mr. W. J. Sturges, the Secretary of the Gas Department, states that the borrowing powers remain as before; no additional capital having been raised during the year. The net debt, after deducting the amount in the sinking fund, stands at £155,725. The capital outlay during the year was £6615, of which £5064 was incurred on account of the railway bridge and sidings, and £1551 for new meters. The total expenditure to the end of the year (after writing off £4521 for depreciation) was £218,324, or equivalent to 10s. 6d. per 1000 cubic feet of gas sold, as against 11s. the previous year. Satisfactory progress is again shown in the sales of gas. Following upon an increase of nearly 13 per cent. in the preceding year's output, there was in the past twelve months an increase of 5·65 per cent. (representing 22,193,600 cubic feet) in the quantity of gas sold. The total amount of gas sold and accounted for during the year was 415,116,300 cubic feet, and the quantity unaccounted for was 20,267,700 cubic feet, or 4·65 per cent. of the gas sent out, which was the same percentage as in the previous year. The number of ordinary meters in use at the end of the year was 3478, an increase of 107; and the prepayment meters numbered 6119, an increase of 637. The aggregate number of meters of both classes was 9597, against 8853. There were also on hire and in use 962 cooking-stoves.

The income derived from the sale of gas, after allowing for discounts and adjustments, amounted to £47,036, or an increase of £1994. The reduction of 2d. per 1000 cubic feet in the price of gas to small consumers absorbed over £500. During the year 66,748 collections were made from prepayment meters; and the cash taken therefrom was £11,671, of which £534 was returned as discount to the consumers. Residual products brought in £539 more than in the previous year. Coke and breeze produced an increase of £722, due to the larger quantity sold; while, on the other hand, tar and ammoniacal liquor together realized £183 less, owing to a falling off in the yield of tar and in the market value of ammonia. The total income from all sources was

£61,353, as compared with £58,845, or an increase of £2508. The expenditure on the year's trading was £41,917, against £40,768, or an increase of £1149. The total charges for manufacturing, including maintenance and renewals of works and plant, amounted to £32,956, or an increase of £841. The gross cost per 1000 cubic feet of gas made works out at 1s. 6·179d., as against 1s. 6·695d., equal to a saving in favour of last year of ½d. per 1000 cubic feet in cost of production.

The average cost of coal used (including all handling charges) was 4½d. per ton lower than the previous year; and the total quantity carbonized was 35,483 tons, yielding 414,466,000 cubic feet of gas, or an average of 11,680 cubic feet per ton of coal, against 11,485 cubic feet per ton the previous year. The quantity of coke used for the manufacture of water gas was 329 tons, producing 20,646,000 cubic feet of water gas, or 62,753 cubic feet per ton. The total quantity of gas made therefore was 435,112,000 cubic feet, an increase of 22,829,000 cubic feet, or 5·54 per cent. There was an improved yield in the quantity of coke produced per ton of coal, a slight falling off in the yield of tar and ammoniacal liquor, and a considerable saving in the quantity of coke used for heating retorts, steam-boilers, and other manufacturing purposes. The cost of distribution, including maintenance and renewals of mains, services, and meters, and also fittings for prepayment installations, shows an increase of £98. The total mileage of mains at March 31 was 48; and the quantity of gas sold per mile of main was 8,648,256 cubic feet.

The gross profit on the year's trading amounted to £19,436, equivalent to 11·237d. per 1000 cubic feet sold, compared with £18,077, or 11·042d. per 1000 feet, for the previous year—an increase of £1359, representing a return of 9·75 per cent. on the outstanding capital debt, as against 9·03 per cent. for the previous year. The balance standing to the credit of this account at the commencement of the year was £7109, to which has been added the gross profit of £19,436, giving a total credit balance of £26,545. The charges in respect of interest on loans and the annual instalments to sinking fund for redemption and extinction of debt, amounting to £10,474, having been fully provided for, the surplus remaining as the net profit for the year is £8961, as compared with £7807, an increase of £1154. After contributing the sum of £2000 to the district rate, the second instalment of £1000 on account of the sum of £5000 towards the cost of erecting the new Council House, and transferring £5961 to the depreciation and suspense fund account, the balance of profit remains the same as at the start of the year—£7108.

In expressing the hope that the results of the year's working would be considered satisfactory by the Gas Committee, Mr. Sturges points out that an increase of 5·65 per cent. in the output has enhanced the amount of net profit 14¾ per cent., as standing charges and interest on loans and redemption of debt are not appreciably higher. There is as yet no falling off in the applications for prepayment-meter installations; and gas for power purposes, competition notwithstanding, is still in demand—eleven new accounts having been secured since the last report. The foresight of the Committee in purchasing their requirements of coal for the coming year before the serious advance in prices, has relieved them of the anxiety affecting gas undertakings generally, and in some instances necessitating an increase in the price of gas to meet the extra cost of coal.

LIGHTING THE SMETHWICK NEW COUNCIL HOUSE.

On Wednesday, the 19th ult., the new Council House which has been erected at Smethwick at a cost of £20,000 was opened, with the customary formalities, by the Mayor (Alderman Edwin Adams, J.P.). The event calls for notice in these columns from the fact that the question of the illuminant to be employed gave rise to much debate, and was eventually decided in favour of gas. For the following particulars in regard to the lighting, which was carried out by the Gas Department under the supervision of the Gas Engineer to the Council (Mr. Vincent Hughes), we are indebted to the "Smethwick Telephone." On the opening day, the elaborate gas-fittings, which had nearly all been specially designed to suit the requirements of the building, were greatly admired. They were supplied mainly by Messrs. Evered and Co., of Smethwick; but some fittings were also obtained from Messrs. Best and Lloyd, Messrs. James Milne and Son, the Birmingham Lighting Company, and others.

Dealing with the fittings in detail, special mention must be made of the handsome pair of newel standards which adorn the principal staircase. Each consists of a heavily-moulded base enriched with four dragons, from which rises a centre shaft supporting five arms; the whole being finished in ormolu gilt. Rising as they do from heavy Doulton newel pillars, they have a very rich effect. The Council Chamber has a highly effective scheme of lighting; the whole of the fittings being specially designed by Messrs. Evered to suit the architecture and fitments of the chamber. Hanging from the centre of the dome, there is a large and handsome fitting, carrying 16 lights, arranged in three tiers of ten, five, and one. These are actuated by three of the Pneumatic Gas Lighting Company's switches placed near the door, the tier of ten lights being operated by two, each controlling five alternate lights, and the other two tiers by the third switch. In addition to this centre light, there are lights depending from the cornice from which the dome springs. There are 20 brackets, arranged in sets of five on each side of the cornice, and handsome three-light descending fittings in each corner. The result, when all these lights are on, is extremely brilliant. In addition to the gas lighting scheme in this chamber, there is a secondary one of electric lighting. The whole of the fittings in the Council Chamber are finished in antique copper, the richness of the colour blending very effectively with the dark oak fitments. There is also a four-light gas corona in the reception-rooms on either side of the chamber. They are of similar design and colour to the fittings inside. Most of the offices throughout the building are fitted with productions from Messrs. Evered's works. The greater part of the building has been provided with inverted fittings manufactured by the Ecliptic Gas Light Company; and on entering the vestibule one's attention is immediately directed to the handsome ornamental gas-fittings suspended overhead. Nothing but admiration can be expressed for the corridor lights, the design of which was, it is stated, taken from an old lamp in Madrid Cathedral.

GAS AND ELECTRICITY AT SHEFFIELD.

At the opening of the Twelfth Annual Convention of the Incorporated Municipal Electrical Association in Sheffield last Tuesday, under the presidency of Mr. S. E. Fedden, the General Manager of the Electric Lighting Department of the Corporation, the Lord Mayor (Alderman R. Styring), as is usual on such occasions, offered a few remarks in welcoming the members. In the course of them, he expressed the hope that they would be able to do more than they had done at any previous conference in the way of promoting the great science of electricity, which, in every department, had made startling advances. His Lordship went on to say that in Sheffield they were singularly handicapped, and had to carry on their electrical undertaking under most trying conditions. They had a Gas Company, who, owing to peculiarly favourable circumstances, were able to sell gas at 1s. 2d. to 1s. 4d. per 1000 cubic feet. He did not know any other place where this could be done; but members of the Association would realize that it was a fact of the greatest importance in the carrying on of their electrical undertaking. He should be the last to complain of this cheapness of gas—the citizens got the benefit of it; but it subjected those engaged in carrying on the electrical industry to a severe strain, which was not to be found in other places. The Lord Mayor having been thanked for his welcome, the President delivered his address; and a vote of thanks was cordially passed to him. The mover of this resolution (Alderman Pearson, of Bristol) raised a laugh by alluding to the "abominable fact" that Sheffield had its gas so much more cheaply than other places in the kingdom.

Referring to this portion of the Lord Mayor's address, the "Sheffield Daily Telegraph" last Wednesday said: "We could not help a sympathetic grin as we heard the Lord Mayor's pathetic description yesterday of the multiform evils of cheap gas. It is hard lines on him. Here he is trying hard to sell a 2d. article for 3d., while somebody else is breezily turning it out for 1½d. The Lord Mayor in his private capacity is a Free Trader. To him and his friends cheapness is politically 'the god of their idolatry.' And what he has to do is to produce electricity at a figure that will give us the same light as gas gives us, for less money. If he cannot do that, he goes by the board. Municipal trading must stand or fall by its achievements in the open market. And so far as Sheffield lighting is concerned, gas *plus* private enterprise has, to put it in the common tongue, 'knocked municipalism into a cocked hat.' Is anybody anxious to double his gas bill in order that the Electric Light Committee may make a profit?"

The subject of the competition of gas with electricity in the city came up again at the dinner of the Association on Thursday evening. In proposing "The Incorporated Municipal Electrical Association," Sir William Clegg said the amount of work the Lord Mayor had done in getting the electric light undertaking established was beyond all praise; but they had a private gas undertaking which was a serious competitor with it. The Gas Company was excellently managed, and those in charge of it were imbued with a great deal of public spirit. The undertaking produced gas cheaper, with one exception, than any private or municipal undertaking in the country; and they could not reasonably find any fault with the way in which the undertaking was carried on, though it offered heavy competition to the Electric Light Department. Some of them would, he thought, have to consider seriously what was the wisest course to follow in regard to the Company in the future. It might be desirable to open up negotiations with them with the object of purchasing the concern. If they could agree upon a price, it might be to the interests of the city that they should acquire the undertaking. At a later stage, in responding to the toast of "The Visitors," Mr. J. Dixon, commenting on Sir William Clegg's remarks as to the acquisition of the gas undertaking, said manufacturers would oppose any such step, because healthy competition was a good thing. Moreover, the time for taking over a gas concern had gone by.

SUPPLY OF ELECTRICITY IN LONDON.

Report of the Parliamentary Committee of the County Council.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present a long report dealing with the circumstances which led to the rejection of the Council's Electricity Supply Bill by the Hybrid Committee of the House of Commons, to which reference is made in our "Electric Lighting Memoranda."

The report sets forth at some length the proceedings before the Committee; and the many difficulties which had to be encountered in attempting to meet the views of the Committee with regard to the preparation of a table of conditions to be embodied in any deed for the transfer of the powers to be given under the Bill are reviewed. The Committee state that they were hampered by the difficulty that while, on the one hand, they wanted to meet the views of the Hybrid Committee, yet on the other they wished to avoid tying the hands of the Council in future negotiations. The most important of the new clauses introduced dealt with the general conditions which should govern any assignment of powers sought in the Bill; and in this, the Committee say, they endeavoured to give effect to the Instruction passed by the House of Commons at the instance of the President of the Board of Trade, to the effect that if any power were conferred upon the Council to transfer or lease to any company, local authority, body, or person any of the powers, duties, or liabilities contained in the Bill, the conditions upon which such power should be exercised were to be embodied in that or a subsequent Bill. In preparing the amended proposals submitted to the Hybrid Committee, the effect of the report on the Bill by the Board of Trade was also considered.

The Committee point out that the Bill would have enabled consumers to obtain a cheap supply of electricity without risking any money of the ratepayers' or requiring the credit of the Council to be pledged in any way for the purpose of the undertaking, and that a supply could have been expected under the scheme at prices ranging

from about 1d. to ¼d. per unit; the present average charges throughout the area of supply being about 3d. "The scheme," the report says, "would have conferred a boon not only upon manufacturers requiring a supply for power purposes and householders requiring it for lighting, but also the travelling public, to whom a cheap supply for traction means so much. It is, indeed, difficult to over-estimate the loss which London has sustained by the rejection of the Bill, particularly in regard to the effect upon the trade of London and the employment of workmen and others dependent thereon." On the close of the case for the Bill last Tuesday, the Chairman (Mr. D. A. Thomas) announced that the Committee desired to deliberate, and the next morning he stated: "The Committee find that the preamble of the Bill is not proved, and we will report to the House accordingly." Complaint is made that no opportunity was afforded the Council to consider how far it might be possible to meet objections entertained in regard to the Bill, and that the Hybrid Committee which dealt with it had given no indication as to the reason which led to their decision, nor made any report on the subject which might have served for guidance in the future.

The report concludes as follows: "The only inference we can draw from the action of the Committee is that they thought the Council should itself carry out and find the money for the proposed undertaking, and that there should be no transfer of the powers. This, of course, would have been contrary to the policy to which the Council is pledged, and to the clearly-expressed wishes and mandate of the people of London at the last election. It would have been contrary even to the views of the Finance Committee, who pointed out clearly in their report of Dec. 11, 1906, the risks and speculative character of the enterprise. It would also have ignored the suggestion in the report of the Select Committee of last session with regard to powers of leasing. . . . We should have been ready to consider any suggestion which the Committee might have put forward in order to find at last a solution of this question, which has been so long outstanding; and we gave a proof of our readiness to meet the wishes of the Committee by preparing the new conditions which provided for the purchase in 1931. The experts advise us that one of the results of the loss of the Bill will probably be the growth or extension of small and uneconomical generating stations and undertakings. The prospects of a large and cheap bulk supply, though favourable to-day, must in the near future become hazardous and speculative. Success in this case hinges on the question of time; and we may never be able to retrieve those opportunities which have been so lightly thrown away. The result is that the Council is no nearer a solution of this question, which is admitted on all hands to be one of the utmost urgency; and while left without any guide from Parliament for the future, we are face to face with the fact that apparently Parliament intends in this matter to override the expressed wishes of the people of London."

The Committee think the matter is of such importance that the Council should place on record an expression of their opinion on the subject. They accordingly recommend the adoption of the following resolution: "That, in the opinion of the Council, it is a matter for deep regret that the London County Council (Electric Supply) Bill, 1907, has been rejected, thereby depriving the elected representatives of municipal London of the opportunity of securing the provision of a cheap supply of electricity subject to public control."

Mr. H. H. Gordon has given notice of his intention to move an amendment to the recommendation of the Committee to the effect that, with a view of ascertaining what steps should be taken to place again before Parliament a comprehensive scheme for the development of electricity for London and adjoining districts, the Highways Committee be instructed to convene a conference of the various local authorities concerned, and to report the result of such conference to the Council as soon as possible.

SALE OF COKE AND RESIDUALS IN GERMANY.

The Annual Meeting of the Economic Association of German Gas-Works, which was formed in 1904, with head-quarters at Cologne, was held recently at Mannheim. The main object of the Association is the sale of the gas coke produced by the constituent works; but it is being extended to the disposal of residual products. During the year 1906-7, the number of gas-works belonging to the Association was 97; and the new members lately admitted have increased the total to 108.

The report presented to the meeting set forth that the demand during the year 1906-7 was very favourable; and it was not possible for the Association to fully meet it. The total deliveries of coke amounted to 239,928 tons, as compared with 200,750 tons in 1905 6; and the average price realized was 16s. 9d. per ton, against 15s. 5d. the preceding year. As the result of a decision arrived at last January, the price of gas coke for 1907-8 was raised 1s. 6d. per ton for the eastern and central parts of Germany, and 2s. per ton for the other districts. By the beginning of February, the constituent works had intimated that 274,000 tons of coke would be available for the current year; and this quantity was speedily sold. Since then very little other coke has been notified for disposal; and unsold stocks are not to be found.

The question of the purchase of coal supplies was also referred to in the report. It appears that the associated gas-works were unable to secure full deliveries of coal last autumn, and also at the beginning of the present year. The deficiency was very considerable in the district of the Saar, where the coal mines are mostly State property; and it ranged from 10 up to 30 per cent. of the tonnage required. As a consequence, it was necessary to purchase a large quantity elsewhere; and the substituted fuel was considerably more expensive. In the circumstances, it is proposed to carefully examine into the present arrangement for buying coal.

The success of the system of uniform sales of coke induced the majority of the constituent undertakings to also entrust to the Association the work of disposing of other products of gas manufacture, more especially tar. As a result, the Association, out of a total production of 70,000 tons of tar, sold about one-half this quantity for 56 works in 1906-7; and in the event of the remainder of the works falling into line, it is hoped to secure suitable prices and ready sales. The Association also disposed of a certain quantity of sulphate of ammonia and other products during the year.

The total value of the turnover of coke and other products amounted to £214,406 in 1906-7, contrasted with £155,000 the preceding financial year; and after paying the owners of the constituent works for their deliveries, and meeting the working expenses, there remains a small surplus, which has been carried forward to the current year.

NEW WATER-WORKS FOR PAIGNTON.

Opening Ceremony.

The formal ceremony of opening the new water-works for Paignton took place on Wednesday last, when the supply was turned on by Mr. F. Layland-Barratt, M.P.

The source of supply is a stream in the Ventford Valley, on Dartmoor, about 5 miles from the town of Ashburton. It is a district with an exceptionally high rainfall, the average for the last seven years being 74 inches; and the watershed is free from human habitations. A storage reservoir has been constructed with a capacity of 200 million gallons. The embankment, which is of granite and concrete, is 616 feet in length; while the greatest depth of the trench was 120 feet, and the excavated length over 800 feet. A roadway carried across the top of the dam is 16 feet in width. In the construction of the dam, about 21,000 yards were excavated; and there have been used 32,000 cubic yards of masonry and concrete. Below the embankment there have been built filter chambers, clean water tank, meter-house, gauge tank for measuring the compensation water, and a caretaker's cottage. The water is drawn off from the reservoir by means of 9-inch and 6-inch valves, fixed in a circular valve-tower, and is conveyed to Paignton through a 9-inch cast-iron main 17 miles in length. A masonry bridge 100 feet in length has been erected at a place where the River Dart has to be crossed; and at Marldon there is a covered service reservoir with a capacity of 600,000 gallons. Arrangements have been entered into by the Paignton Urban District Council for affording supplies of water to the towns of Teignmouth and Brixham and to the village of Ipplepen. Teignmouth is to be entitled to a maximum supply of 250,000 gallons per day, with a minimum of 150,000 gallons, at a cost of 5½d. per 1000 gallons. The supply to Brixham will be afforded on the basis that the minimum is to be 75,000 gallons per day, and the maximum 200,000 gallons, at the price of 6d. per 1000 gallons; while Ipplepen will have 16,000 gallons per day, at 8d. per 1000 gallons. For the supply of Teignmouth, a 9-inch pipe is being laid, and has yet to be carried under the River Teign; while Brixham will be served through a 7-inch main about 6 miles in length. All the works are nearing completion; but in Paignton itself there have still to be carried out supplementary works for the distribution of the supply, the cost of which is estimated at £12,000. In the Act authorizing the works, which was passed in 1900, power was given to the Paignton Council to borrow £70,000, and such other sums as might be necessary. The additional amount borrowed has been £41,000; so that the cost of the undertaking, exclusive of the distribution works, has been £110,000. Mr. F. W. Vanstone is the Engineer of the scheme, and Mr. Baldwin Latham has acted as Consulting Engineer. Messrs. Hawkings and Best, of Teignmouth, were the Contractors for the storage works; and Mr. Grisenthwaite, of Penrith, laid the main and built the bridge over the Dart.

At the opening ceremony, Mr. Layland-Barratt was presented by Mr. Vanstone with a silver key, with which he unlocked the door leading to the valve chamber and turned on the water into the filter-beds. A large number of gentlemen attended the ceremony, among them being members of the Torquay Town Council and the Paignton, Teignmouth and Brixham District Councils. Mr. Layland-Barratt congratulated Paignton on the approaching completion of the scheme, as well as the other towns which would benefit with it from the advantages of a pure water supply. Though the undertaking had cost more than was contemplated, Paignton would derive great benefit from it, and would no doubt witness a development of building at the higher levels which could not be supplied from the old works. Mr. W. Lambshead, the Chairman of the Water Committee, explained that the cost of the undertaking had been increased by the construction of filter-beds (which were not originally contemplated), by the necessity of raising the dam to supply Teignmouth and Brixham, and owing to the difficulty experienced in finding a solid and water-tight foundation for the dam. These difficulties had been overcome; and he was confident that they had a perfect scheme. Mr. Vanstone expressed the opinion that they had an absolutely water-tight dam. The reservoir was now about three-parts full; the depth at the dam being 47 feet, or about 7 feet from top-water level. The water area was about 26 acres; and it contained about 150 million gallons, which had been impounded in 57 days. This was equal to 100 days' maximum supply for the various towns.

Gas Supply at Stafford.—In the "JOURNAL" for the 11th ult., we gave some figures showing the financial position of the gas undertaking of the Stafford Corporation on the 31st of March last. We now supplement them by a few particulars in regard to the supply of gas. The quantity sent out during the year from the works (which are under the supervision of Mr. Hubert Pooley) was 190,657,000 cubic feet; being a decrease of 995,000 cubic feet as compared with the previous year. The quantity sold to private consumers was 184,350,782 cubic feet; being an increase of 429,929 cubic feet. The gas unaccounted for was 3 923,018 cubic feet; being at the very low rate of 2·06 per cent. of that sent out. The revenue from the sale of gas, less the service to public lamps, amounted to £23,782—a decrease of £147. The sale of residuals resulted as follows: Coke, £4092; tar, £1221; and sulphate of ammonia, £1640—total, £6953, or an increase of £474, due entirely to the improvement in the coke market. Though about 478 tons more coal were carbonized during the year, the cost of coal, &c., was rather less than before.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The year which closed on May 15 has proved to be one of the most prosperous experienced by the Edinburgh and Leith Gas Commission. Were it not for the cloud, in the shape of dearer coal, which is at present hanging over all gas undertakings, it might be hailed as the most auspicious. The Commissioners have reached a turning in the long lane of capital expenditure upon new works, which they have been traversing for some years, and, with the economies they have been able to effect in the manufacture of gas, there was the certainty, had things continued as they were, that the community would have reaped benefits they have not hitherto enjoyed, while the Commissioners would have had the great comfort of working an up-to-date undertaking. But this prospect is, at the present moment, obscured by the advent of higher charges for coal. In the year which the Commissioners have closed, they have sold a greater quantity of gas than they ever did before, in any one year, by 78 million cubic feet. Their next largest sale was in the year ending in May, 1905. Economies in manufacture have been referred to. How great these are will be seen when it is stated that the first section of the Granton works was opened in February, 1903, and that in the year ending in May of that year the output of gas was 1803 million cubic feet, which required 189,295 tons of coal, at a total cost of £116,200; whereas in the year being dealt with, in which all the work has been done at Granton, the quantity of gas sold has been 1931 million cubic feet, produced from 178,524 tons of coal, costing £104,000. We know that carbonizing charges have been very much reduced at Granton. The figures I have given bring out that there is the further great economy of more gas being obtained from the coal. A perusal of the expenditure side of the revenue account reveals that while the Commissioners expended £6875 more than in the year before, £2700 of this sum was due to paying increased salaries and wages, and the rest is quite accounted for by the outlays in connection with the unfortunate brewery well case. The revenue derived from gas was not by any means the largest which has been earned. In the year ending in May, 1902, it amounted to £291,164; and so the past year's revenue of £265,181 represents a saving to the community of £25,983—equal to, roughly, 3d. in the pound upon the rates—accomplished in five years. The great increase in the return from residuals is also notable. In the year 1901-2, the sum realized was £35,720; last year it was £59,190—an increase of £23,470. Increasing revenue and diminishing expenditure have led, in the result, to the largest balance ever carried to the profit and loss account—£102,120—the next largest having been £91,733, in 1904-5. In that year, however, the standing charges were £11,481 less than last year, because the increase of capital had not then begun to tell. In the gas-stove account, the most noticeable feature is the absence of profit. The prices for sales and rents for hires are so adjusted as not to bring revenue so much from themselves as to encourage the use of gas. The gas-stove account is made to square—and most probably something more; but the profit in the trade is in the gas which is sold for them. We need not doubt that a considerable proportion of the £11,769 extra derived from the sale of gas was due to the larger consumption in cooking and heating which is now being experienced as the result of the facilities offered. The accounts lie with the Auditor for a month; and it is only after they have been certified by him that the Commissioners can deal with them.

At the meeting of the Commissioners on Monday, the Works Committee reported that they had resolved to acquiesce in the decision in the brewery well case, and had authorized a cheque for the amount of the damages awarded, and interest, to be signed.

It was mentioned some time ago that Messrs. Muir had intimated a claim upon the Gas Commissioners in respect of the alleged pollution of their other well, situated near to the one the claim for which they have successfully vindicated. The second action was called in the Court of Session to-day, before Lord Salvesen. The nature or amount of the claim has not, as yet, been disclosed.

In the Glasgow Town Council on Thursday, Mr. T. Calderwood, the Convener of the Gas Committee, stated that the contract price of the coal they had purchased for the ensuing twelve months was 3s. per ton above what they paid under last year's contracts. This, on a purchase of 700,000 tons, meant an additional charge upon the undertaking of £110,000.

It is intimated to-day that the offer of £9500 which the Town Council of Lanark made to the Lanark Gas Consumers' Company, Limited, as the price of their undertaking, was considered by the shareholders at a meeting on Friday. According to the constitution of the Company, a sale could not take place unless the proposal to do so was carried by a three-fourths majority of the shareholders. A motion to accept the offer of the Town Council was supported by 628 votes, and a counter-motion by 352 votes. As there was not the requisite majority, the offer of the Town Council was refused.

The report of the Directors of the Galashiels Gaslight Company, to be submitted to the 23rd annual meeting of shareholders, states that the profit for the past year was £2319, which, added to a reserve of £6785, makes a total of £9104, out of which it is proposed to pay a dividend of 10 per cent., absorbing £2100, and leaving the reserve at £7004. The quantity of gas manufactured during the year amounted to 70,682,800 cubic feet. The loss by leakage was 3,582,569 cubic feet; and there were used in works and offices 706,800 cubic feet. The quantity which passed through consumers' meters was 66,393,431 cubic feet—an increase upon the previous year of 3,972,809 cubic feet. In consequence of the serious rise in the price of coal, the Directors have found it necessary to advance the price of gas to 2s. 11d. per 1000 cubic feet; being 2½d. above what it has been for two years.

The Directors of the Kelso Gas Company have declared a dividend of 10 per cent., and, notwithstanding the large increase in the cost of coal, they have resolved not to make any advance in the price of gas.

The Directors of the Kinross and Milnathort Gas Company report that the whole of the capital of the Company, amounting to £3004, has been fully subscribed. There is a disposable balance of £339, out of which it is proposed to pay a dividend of 7½ per cent., which will account for £225; a sum of £64 is to be applied towards depreciation; and £50 is to be added to the reserve fund.

The Auchterarder Gaslight Company have paid a dividend of 6½ per cent. The price of gas for illuminating purposes has been raised from 5s. 10d. to 6s. 0½d. per 1000 cubic feet; for cooking purposes, it is to remain at 4s. 7d. A sum of £50 was voted to the Manager—Mr. A. Lobban—for his good management during the past year.

The report of the Directors of the Kirkcaldy Gas Company states that the make of gas continues to increase in a satisfactory manner; but they regret that, owing to the large advance in the cost of coal, they have been compelled to recommend that the price of gas be raised from 3s. to 3s. 4d. per 1000 cubic feet.

The annual meeting of shareholders of the Stonehouse (Lanarkshire) Gas Company, Limited, was held on Wednesday. It was stated that there had been a great increase in the consumption of gas, owing to the adoption of gas-cookers, of which the Company had issued 69; and many consumers were still anxious to get them. There were 45 new consumers during the year.

CURRENT SALES OF GAS PRODUCTS.

Week ending June 29.

Tar products in the London market have shown little change during the last few weeks. 90 per cent. benzol has become slightly easier, and may be called 9d. per gallon net. 60° crude carbolic is likewise a little lower, at 1s. 7½d. to 1s. 7¾d. net; and in this follows crystals, which are nominally 5½d. for 35° and 5½d. for 39-40° and are generally rather quiet. Creosote is in very good demand, and nothing under 3d. net would be accepted for this year; indeed, this figure is bid readily for next year. Pitch is firm; and sellers quote 30s. 6d. to 31s. without wishing to sell. Sulphate of ammonia is quietly firm, and, owing to the entire absence of stock, is in a very strong position; and this is accentuated by the continued high price of nitrate of soda.

Sulphate of Ammonia. LIVERPOOL, *June* 29.

There has been a steady demand throughout the week, more particularly for ready parcels; but it has not been sufficient to establish an advance in prices, makers being anxious to clear out their bins as far as possible by the end of the half year. The closing quotations are consequently £11 15s. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. There has also been some buying for July delivery at about the level of spot prices; but farther ahead the firmness of makers has hindered business. For July-December, £12 2s. 6d. per ton is quoted; and for January-April, £12 5s. per ton. These prices are quite 2s. 6d. per ton above buyers' present ideas.

Nitrate of Soda.

This article is steady at 11s. per cwt. for 95 per cent., and 11s. 3d. for refined quality.

Tar Products. LONDON, *June* 29.

The market remains practically unchanged; and creosote continues very firm. In pitch, there is now very little business doing for prompt delivery, though it is reported that a small quantity has been sold on the east coast at 25s., and there are still one or two manufacturers willing to sell at low figures. For forward delivery, the value is unaltered, though, owing to the absence of demand from the Continent, the market does not appear quite so firm as was the case a short while ago. In Liverpool, business has been done at 27s. for a moderately large quantity. On the east coast, however, makers hold out for 30s., and refuse to consider anything under this figure; but dealers cannot at present pay this price. In South Wales, some quantity has been sold for delivery to June, 1908, at 31s. For creosote, London manufacturers now ask 3d.; and it is reported that 2¾d. has been refused for this quality to the end of the year. In the Midlands, 3d. is still the price asked; and in the North, 2¾d. is the ruling price. Higher figures will very likely be reached before long. Benzol 90 per cent. remains very much depressed, with no alteration in price; but in 50-90's it is reported that some quantity has been offered at 9d., at maker's works. This has been refused, however, and firm offers cannot be obtained from consumers, as there appears to be no demand whatever for this article. Toluol is still very weak, and in no request. In solvent naphtha, the position remains unchanged, and there is not very much business doing. Carbolic acid is still quiet, and consumers do not seem at all anxious to buy. No business is reported in anthracene.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 26s.; east coast, 25s. to 25s. 6d.; west coast, 24s. Benzol, 90 per cent., 7¾d. to 8¼d.; 50-90 per cent., 9¼d. to 10d. Toluol, 11d. to 1s. Crude naphtha, 4¼d. to 4½d.; solvent naphtha, 1s. 1d. to 1s. 3d.; heavy naphtha, 1s. 2d. to 1s. 3½d. Creosote, London, 2¾d. to 3d.; North, 2½d. to 2¾d. Heavy oils, 3d. to 3½d. Carbolic acid, 60 per cent., 1s. 7½d. to 1s. 8d. Naphthalene, £6 10s. to £12 10s.; salts, 35s. to 42s. 6d. Anthracene, "A" quality, 1½d. to 1¾d.

Sulphate of Ammonia.

There does not appear to be much demand at the present time; and the market is a little easier. The principal London Gas Companies now ask from £12 1s. 3d. to £12 2s. 6d. Ordinary London make, however, can still be bought on Beckton terms at £11 15s., and on f.o.b. London terms at £11 16s. 3d. to £11 17s. 6d. In Leith, the values may be taken as slightly under last week's ruling prices—varying from about £11 18s. 9d. to £12 for prompt delivery, and £12 1s. 3d. to £12 2s. 6d. for forward. In Liverpool, the ruling value may be taken at about £11 17s. 6d. for prompt delivery, and at about £12 to £12 1s. 3d. for forward. In Hull, the price is still £11 15s.

COAL TRADE REPORTS.

Lancashire Coal Trade.

During the last few days, a welcome change has come to our weather; and the effect on the coal market has been to lessen the demand for domestic requirements. Little impression, however, has been felt in other kinds of fuel. There is no alteration to note in quotations. Coal, instead of being cheaper, will be rather influenced the other way if the action of the Railway Companies in increasing carriage rates is carried out. It will be remembered that some time ago the Railway Companies, through the Railway Clearing House, announced their decision to raise their rates for carrying coal, coke, breeze, and patent fuels. Henceforth it is their intention to charge for these commodities at standard imperial avoirdupois weights, instead of reckoning 21 or 20½ cwt. to the ton, or making their customary allowance of 2 cwt. over the actual weight carried per truck. The Railway Companies urge increased cost of raw materials in railway industries and other advancing charges, as well as competition, as the causes of their action. The colliery proprietors naturally object to the threatened impost. A meeting of coal owners was held at the Queen's Hotel, Manchester, on Tuesday, when it was resolved to contest the increased rates of the railway companies.

Northern Coal Trade.

In the coal trade, there has been a lessened production on Tyneside, owing to the chief local holidays of the year, so that the shipments have been a little restricted. In the steam coal trade, the inquiry has been full, and—apart from the cause named—the output is good, with a strong demand. Prices have been steadier. Best Northumbrian steam coals are from 14s. 3d. to 14s. 9d. per ton f.o.b., second-class steams are 14s. to 14s. 3d., and steam smalls are rather scarce at 10s. to 10s. 3d. Gas coals are active, the deliveries having been very heavy this season, and the demand being full both for export and home use. Prices for Durham gas coals for occasional sale vary from about 13s. 3d. to 14s. 10d. per ton f.o.b., though there are still deliveries at much lower figures. Contracts for gas coal are being negotiated both for some of the home companies and for export; and while the prices vary considerably according to the quality, it may be said that there have been sales made from 14s. even to 14s. 6d. per ton f.o.b. for the best kinds, with second-class coals at prices that show corresponding advances on those of the expiring contracts. Other contracts are in the market, but not for large lots. Coke is steady; and gas coke in some cases shows a rise in value—good gas coke being quoted as high as 17s. per ton. f.o.b. on the Tyne.

Scotch Coal Trade.

The market is reported as strong and active; the greatest activity being, as for some time past, in the shipping trade. The Edinburgh and Leith Gas Commissioners are about to purchase the balance of their requirements for the year; and the prices they will be able to get coal at, for forward delivery, will be a good gauge of the probable state of the market in the remaining months of the year. Prices meantime continue to be steady. They are quoted as: Ell 12s. 3d. to 13s. 6d. per ton f.o.b. Glasgow, splint 12s. 3d. to 12s. 6d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 311,602 tons—an increase of 6306 tons upon the previous week, but a decrease of 5706 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,704,193 tons—an increase of 365,681 tons upon the corresponding period of 1906. Lord Ardwall has to-day issued his award as arbiter in the matter of a further application by the miners of Scotland for an increase of 12½ per cent. to their wages. He heard evidence on the subject in Edinburgh on Monday. In his award, he finds the men entitled to an advance of 6¼ per cent., equal to 3d. per day. This is the fourth advance of a similar amount which the men have received this year. Their wages will now be 6s. 9d. per day.

The Suggested Sliding-Scale for Gas-Coal Contracts.

In a report from the Newcastle Exchange on the subject of gas coal, the "Newcastle Chronicle" says: "At the great gathering of gas engineers, the President, Mr. Charles Hunt, drew attention to the upward tendency of the coal market, as a source of considerable anxiety to the trade they represented. He went on to consider the suggestion that the price of coal should be regulated by Government, as Parliament regulates the price of gas; but he dismissed the idea, though he looked with more favour on the suggestion that 'it ought not to be impossible to arrange a sliding-scale of prices for a term of years that would be equitable to all concerned.' As there is a recognition of the fact that the gradual exhaustion of the most easily-workable seams is causing a permanent increase in the cost of coal-getting, it is possible the suggestion of a sliding-scale might have in it a germ that in the future would do something to limit friction in gas-coal contracts.

Price of Gas at Barry.—When considering an application from the Llandaff and Dinas Powis Rural District Council for a reduction in the price of gas (3s. 9d. per 1000 cubic feet), Mr. S. R. Jones, the Chairman of the Barry Gas and Water Committee, said he thought that the time had come when a reduction could be made. Therefore he suggested that they should reply to the application that the matter would be put before the Council for consideration. This was agreed to.

Local Government Board Inquiry at Leek.—On behalf of the Local Government Board, Mr. W. A. Ducat lately held an inquiry at Leek, with reference to applications to borrow £2255 for works in connection with the proposed supply of gas to the parish of Longsdon and to Rudyard, and £3000 for new meters, fittings, mains and services, and stoves. It was stated that the Ratepayers' Association did not oppose the applications; but they thought the Council were not asking for sufficient money with regard to the extensions to Longsdon and Rudyard. As to the other matter, it was, in their opinion, a good thing to borrow the money rather than pay it out of revenue.

Now Ready, a Handsome F'Cap Volume giving a complete account of the

GRANTON GAS-WORKS

OF THE

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS

. . . Their . . .

Design, Construction, and Equipment,

WITH

ILLUSTRATIONS, PLATES, AND DETAILS OF COSTS,

BY W. R. HERRING, M.INST.C.E., &C.

The volume consists of 300 pages, embellished with 228 Photographic and other Illustrations, and 28 large folding Plates. In addition, the Appendices give (in full) the Specifications and detailed Schedule of Quantities of the Brick and Puddle Gasholder Tank and of the Four-Lift Telescopic Holder at Granton.

Bound in Cloth, price 16s. net cash, free delivery.

Orders may be sent through any Bookseller, or direct to the Publisher,

WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Encouragement of Artizan Cookery.

The Plymouth Education Authority have published details of the scheme under which they will award prizes for efficiency in artizan cookery which, as announced by Sir Joseph Bellamy at the annual meeting, the Plymouth and Stonehouse Gas Company are offering for competition among the scholars of the local schools. In all, 27 schools in Plymouth will take part in the competition. To the girls attending each cookery centre for public elementary schools, there will be given two school prizes of 5s. each for each school sending three or more classes, and one of 5s. each for each school sending less than three classes. Three prizes of 5s. will also be given to the girls attending the secondary school centre. In addition, there will be centre prizes of 10s. 6d. and 5s. each to be competed for by the girls who obtain the school prizes. The conditions governing the competitions are that the girls are to make a full attendance at the cookery course. The practical artizan cookery of each girl attending the centre is to be assessed in an approved manner during the training course; and at the close there is to be a written examination on the work done. The school prizes will be awarded to the girls obtaining the highest number of marks in this examination. In competing for the centre prizes, the winners of the school prizes will be expected to prepare a dinner in accordance with a menu which will be given to them; and the lady members of the Education Committee will award the prize to the girl whose work reaches the highest standard of excellence. The cooking will, of course, be done by gas. The scheme will cost £13 14s. a year.

Expectations Exceeded at Stockport.—It was announced at the last meeting of the Stockport Gas Committee, by the Chairman (Mr. James Fernley), that the profits on the past year's working of the undertaking have exceeded all expectations. It was estimated that they would amount to £14,000; but the sum actually realized has been £17,400, or £3400 more than was anticipated. It has been decided to allocate £13,000 to the relief of the rates; and it was expected that the balance will be handed forward towards the rates of next year.

Tipton Gas Supply.—The revenue of the Gas Department of the Tipton Urban District Council for the year ending the 31st of March last was £18,674, and the expenditure £12,426; leaving a balance of £6248, compared with £6531 for the preceding year. After meeting interest and sinking fund charges, there was left £1509 to go to the accumulated profits account; bringing it up to £3757. Under the supervision of Mr. S. O. Stephenson, the Council's Gas Engineer and Manager, 10,786 tons of coal were carbonized, and 485 gallons of benzol and 69 gallons of petroleum used; and 125,602,000 feet of gas (coal and water gas) were produced, or at the rate of 11,645 cubic feet per ton. The quantity sent out was 125,502,000 cubic feet, of which 107,841,700 cubic feet were sold and used on the works; being a decrease of 1·82 per cent. compared with the year 1905-6. The residual products were 7705 tons of coke and breeze, 126,680 gallons of tar, and 262,886 gallons of 10-oz. ammoniacal liquor.

Oldbury Gas Undertaking.

The General Manager of the gas undertaking of the Oldbury Urban District Council (Mr. Adam Cooke) has presented the statement of accounts for the year ended the 31st of March last. The net revenue from the sale of gas to consumers by meter, at prices ranging from 3s. 4d. down to 1s. 6d. per 1000 cubic feet (the last-named figure being for gas used for motive power), and also for public lighting and under contracts, was £14,479; the sale of residuals produced £3628; and the total receipts were £18,345. The manufacture of gas entailed an expenditure of £8850; distribution cost £1307; management, printing, &c., £349; and public lighting and rents, rates, and taxes made up a total of £12,437—leaving a balance of £5908. Dividend on Consols and bankers' interest brought this up to £5972, out of which £2134 was paid as interest, £923 was required for the sinking fund, and £600 was transferred to the general district rate account; leaving a sum of £2315 as the net profit. Adding £6894 brought forward, produced £9209. The working statements show that 9238 tons of coal were carbonized, and 115,253,000 cubic feet of gas made therefrom; the quantity of oil used being 29,846 gallons, which yielded 11,243,000 cubic feet of gas—bringing up the total to 126,496,000 cubic feet. Of the total make of gas, 101,726,000 cubic feet were sold by meter, 14,373,000 cubic feet in all were consumed in the public lamps, and 2,901,000 cubic feet used on the works; making a total of 119,000,000 cubic feet, and leaving 7,496,000 cubic feet, or 5·9 per cent., unaccounted for. The residuals produced in the twelve months were: Coke, 5773 tons; breeze, 60 tons; tar, 115,264 gallons; ammoniacal liquor, 213 050 gallons; and sulphocyanide, 33,204 gallons.

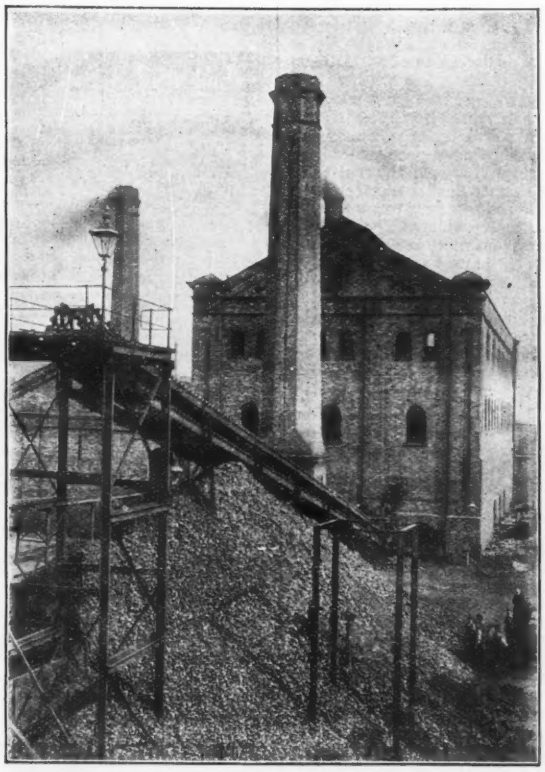
Suicides by Gas.—A verdict of "Suicide while of unsound mind," was returned by the Coroner's Jury who inquired into the death, at Finchley Road, of an artist named Elinor Cook, who was found in her bathroom with the taps of a gas-ring and a gas-bracket both turned on full. It was stated that deceased had repeatedly threatened to commit suicide. A similar conclusion was come to by the Jury in the case of a Sparkhill jeweller, who fastened a piece of rubber pipe to a turned-on gas-jet, and inserted the other end in a pillow case, which he placed over his head. He had been very depressed, and often complained of pains in his head.

Price of Gas at Ripon.—The Gas Committee reported at last week's meeting of the Ripon City Council that they had had under consideration the question of raising the price of gas. At present the charge is 3s. 4d. per 1000 cubic feet; and there was a feeling that an additional 2d. would tide the gas-works over the increase in the price of coal. It was reported that the deficit on the gas revenue had increased in the last financial year from £3367 to £3699, an increase of £332; and during the current year the advance in the price of coal would involve the works in an extra outlay of £437. The Mayor stated that the Committee had decided to postpone the consideration of the subject till the August meeting; and the action of the Committee was confirmed.

FROM COAL BARGE TO COKE CART

INCLINED RETORTS
AND
HIGH-CLASS
AUTOMATIC MACHINERY
FOR
SAVING LABOUR.

Castings, Hoppers, Tanks, &c.



Complete Plants for Gas-Works erected entirely by our own Employees in all parts of the World, to our own or Customers' designs.

Barge Unloaders, Crushers,

CONVEYORS, ELEVATORS,

Measurers, Automatic Carbonizing Plants, Hot Coke Conveyors, Screens, Loading and Bagging Plants.

ALSO

Conveyors for Oxide, Sulphate, Pitch, and Ashes.

Telegrams:
"APTITUDE BIRMINGHAM."
Telephone: 50 SMETHWICK.

NEW CONVEYOR CO., LTD., SMETHWICK.

Increase of Price by the South Suburban Gas Company.

In consequence of the great rise in the cost of coal, the Directors of the South Suburban Gas Company have had to inform the consumers that, instead of reducing the price of gas this year, as they hoped to do, they are compelled to increase it by 2d. per 1000 cubic feet from Midsummer—making it 2s. 7d. per 1000 cubic feet. In a circular-letter signed by the Secretary (Mr. Charles Ohren) notifying the change, the Directors explain that in the spring of last year the rise in the price of coal began, owing largely to the activity of the iron trade; but the great and serious advance did not take place until after the duty on exported coal was repealed on Nov. 1, 1906. The foreign demand then greatly increased, and the price of coal went up in far greater proportion. It is pointed out that the Company work under the sliding-scale, which allows an increase of 3s. 4d. per cent. of dividend for every reduction of 1d. per 1000 feet, and correspondingly reduces the dividend when the price of gas is increased. It amounts to a very considerable sum on the capital of £605,000. This makes shareholders and consumers partners in prosperity and adversity. The principle has also been extended to the employees of the Company, who get a bonus in the form of a percentage on salaries and wages for every penny reduction in the price of gas, and lose it when the price is increased. The bonus at present amounts to 6½ per cent., but the increase of price will reduce it to 5 per cent. Thus all the parties interested—consumers, shareholders, and employees—suffer from the advance in the price of coal. As these form a triple partnership, the Directors say they may rest assured that the price will be reduced as soon as possible.

Plymouth Gas-Works Employees' Annual Outing.

Last week the employees of the Plymouth and Stonehouse Gas Company had their annual outing. As usual, an excellent programme was arranged; but the weather unfortunately proved to be unfavourable. In order that the work might be carried on without interruption, the employees were divided into three parties, the first of which went on Tuesday, and was accompanied by Sir Joseph A. Bellamy, the Chairman, Mr. T. Greek Wills, and Mr. H. D. Bewes, Directors, Mr. H. B. Heath, Secretary, and other officials and visitors. Mr. Percy S. Hoyte, the Engineer and Manager, had general charge of the arrangements. The company, which, with the wives and sweethearts of the men, numbered about 200, drove in waggonettes to Princetown, where luncheon had been prepared. After the luncheon, the toast of "The Chairman and Directors" was heartily drunk; and Sir Joseph Bellamy, in acknowledgment, said that the Directors appreciated to the full the real goodwill which had been shown and the efforts made by the employees in helping to bring about another prosperous year. Referring to the new Workmen's Compensation Act, Sir Joseph remarked that it would not in any way improve the position of the workmen in the service of the Company, who were already in the enjoyment of every possible benefit which could be provided. The Directors had insured all the workmen to the fullest extent—beyond the requirements of the Act, so that in the event of accidents they would receive compensation without regard to any restriction which the Act might contain. Some of the party returned to Plymouth by train from Princetown; but the rest drove to Tavistock, where tea was partaken of. Other parties went through the same programme on Wednesday and Thursday.

Working of Minerals under Water-Works.

The Nottingham Water Committee point out to the City Council that the workings of the Bestwood Coal and Iron Company's colliery have been for some time gradually approaching the Bestwood Water-Works of the Corporation. By the agreement with the Duke of St. Albans, under which the sites of the Bestwood Water-Works and the Red Hill reservoir are held, the minerals under such sites, and for a width of 2 chains round the same, are reserved for the protection of the water-works and reservoir. The Committee have had under consideration the desirability of allowing the coal under such sites to be worked, as they are advised that less risk and danger would arise if the coal were worked continuously in one unbroken line under the sites, rather than that the coal should be left in the form of a pillar for their support. In the latter case, there is a probability that the working of the minerals outside the limits of the coal reserved would do more serious damage to the pumping station and reservoir than if the coal were completely worked out. The Committee are satisfied that the safer course is to allow the minerals to be worked out under the sites; and they think it would be well to enter into an agreement for this purpose on the best terms they can obtain. The Committee mention in their annual report that, after paying the annuities, and interest on loans and consolidated stock, and the annual contributions to the different sinking funds, the balance amounts to the sum of £5718. This they have carried to the account for depreciation, renewals, Derwent water, compensation to workmen under the Workmen's Compensation Act, 1897, and other purposes, making the fund £38,634. On March 31 last there were £75,622 houses supplied. All other supplies numbered 52,941, making a total of 128,563. The estimated population supplied was 340,299.

Railway v. Canal Carriage of Coal to Gas-Works.—It appears that the revenue from the Exeter canal has fallen off during the past quarter, owing to the Gas Company, instead of having their coals by ship through this ancient waterway, preferring overland carriage. This change, as one of the city councillors recently pointed out, is most probably owing to the dues not having been lowered sufficiently for the canal to act as a rival to the railway. The works of the Company are situated close to the canal, and the shipment of coals must have been a great convenience to the consignees. The Navigation Committee are considering the whole question of canal charges, with a view to recovering the support of the Gas Company, who have been for years the best customers of the City Council, as part owners and directors of the canal. The whole subject has a sentimental as well as a business side; for the canal is the first ship canal ever made in England, and the citizens regard with a sort of pathetic regret any diminution of its usefulness or earning powers

"CANNON"

Our Chairman Smiled

When he read the article:—

"The Present and Future of Gas Cookers and the Trade,"

(Commencing on p. 658 of the Gas World of 25th May, 1907).

As the PIONEERS of Progress and Economy

we have had our reward, as proved by the enormous growth of our works.

EXAMINE OUR COOKERS!!
Observe the Advantages!!

SEE OUR CATALOGUES OF
COOKERS,
FIRES, and
METERS.

SLOT INSTALLATIONS COMPLETE.

Value for Money.

CANNON IRON FOUNDRIES, LTD.,
DEEPFIELDS, Nr. Bilston, STAFFS.
London Office and Show-Rooms:
Bath House, 57-60, Holborn Viaduct, E.C.

Australasian Agents:
JAMES HURLL & CO., Ltd., 20, Loftus Street, SYDNEY,
and Box No. 4 (G.P.O.) Dunedin.

Increases in Price.—The price of gas at Gravesend has been increased from 3s. to 3s. 2d. per 1000 cubic feet to ordinary consumers, and from 2s. 10d. to 3s. to users for power purposes. This course has been necessitated by the advance in the cost of coal. The Truro Gas Company announce an increase of 2d. per 1000 cubic feet.

New Joint-Stock Companies.—The Bedale Gas Company, Limited, has been registered with a capital of £2000, in £5 shares. It is the re-incorporation of the Company under the Companies Acts—it having been originally constituted by memorandum of co-partnership on Nov. 14, 1838. All the shares were taken up and paid for in full prior to the conversion. The Non-Explosive Gas Company, Limited, which has been registered with a capital of £150,000 in £1 shares, will carry on the business of gas and illuminant manufacturers and distributors, &c. The Incandescent Supply Agency (Richmond), Limited, the capital of which is £1000, in £1 shares, will acquire a business in the town named in the title.

Price of Gas for Public Lighting in South London.—The Secretary of the South Metropolitan Gas Company (Mr. Frank Bush) has informed the Borough Councils in the Company's district that, owing to economy in working and the reduced cost of mantles, the Company would, but for the increase they have had to make in the price of gas, have been able to reduce the charge for all public lamps with Nos. two, three, and four burners. With the increased cost of producing gas, however, a reduction in the price paid per lamp is not possible. The economies in maintaining the lamps do not quite balance the extra cost of gas; but, taking all the circumstances into consideration, the Directors have decided not to make any alteration in the price of public lamps fitted with the above-named burners, the rates for which will remain at the present figures—£2 9s. 2d., £2 16s. 9d., and £3 4s. 5d. per lamp.

Water-Rate Payments in Advance at Slough.—A public meeting of ratepayers has been held in Slough to protest against the action of the Water Company in demanding the payment of three months' rate in advance, and to consider what steps should be taken in the matter. The Chairman (Mr. H. W. Pountney) said there were two courses—to appoint a deputation to discuss the question with the Company, or to collect a fund to defend a test case. Eventually the following resolution was put to the meeting and carried unanimously: "That this meeting of ratepayers desires to publicly record in the strongest terms of disapprobation a protest against the action of the Water Company in seeking to recover payment of three months' water-rate in advance, and proposes that a deputation of ratepayers be nominated to meet and discuss the withdrawal of the objectionable condition of payment in advance with the Water Company." The members of the deputation were subsequently chosen.

Llandudno Gas and Water Supply.—At the last monthly meeting of the Llandudno Urban District Council, the reports of the Gas, Water, and Electricity Committee were presented. In moving their adoption, Mr. T. W. Griffith called attention to the report of the Accountant (Mr. W. Wood) upon the undertakings for the year ended March 31 last. There was a profit on the electric light account of £1077, of which £300 had been applied in relief of rates and £664 transferred to the reserve fund, which now amounted to £2013. The profit of the gas undertaking was £1585, of which £500 was carried to the depreciation fund, raising it to £3737. A loss of £827 was shown on the water-works account; but this was considerably less than the loss in the previous year—the amount then being over £1000. The deficiency had been made good by a transfer of £827 from the profits of the gas undertaking. These figures, Mr. Griffiths said, showed that the two strictly trading undertakings of the Council were in a flourishing condition.

Claim by a Lamplighter.—At the Wellington (Somerset) County Court, before his Honour Judge Beresford, Bert Wood sued the Wellington Gas Company for a week's wages, 24s., in lieu of notice. Mr. E. Lee Mitchell represented the defendants. Plaintiff handed to the Judge a letter he received from the Company's Manager on the 16th of May, informing him that, in consequence of a complaint that the lamps were extinguished in his district an hour before time the previous night, his services would no longer be required. He was paid up to the day he left. Mr. Lee Mitchell said Wood was an assistant-stoker at the gas-works, and also a lamplighter for a certain district. It took a man about three-quarters of an hour to go round and light the lamps. On the 16th of May Wood took three hours over it. On his return to the works he did not stay very long. Without saying a word to the chief stoker, he left before ten o'clock to extinguish the lamps. His Honour said he could not alter the law, though he would do so if he could. The law, not common sense, was in plaintiff's favour. He was entitled to a week's notice; and therefore judgment would be given for the amount claimed.

Street Gas Lighting in Battersea.—At the meeting of the Battersea Borough Council last Wednesday, the Lighting Committee reported the receipt of a letter from the Comptroller of the London County Council (Mr. H. E. Haward), suggesting the reconsideration of an application for sanction to a loan of £2270 for lighting by electricity the roads on the Park Town Estate. In the course of his communication, the Comptroller said: "It has been reported to the Finance Committee that 12 out of the 14 streets are unimportant side streets; and, having regard to the heavy cost of installing electric light, and to the fact that little, if any, use would be likely to be made of the mains for private supplies, the Committee do not view with favour the application for the loan. I am directed to inquire further whether the Borough Council have considered the relative cost of lighting the streets with gas and electricity. The Committee are advised that the existing flat-flame gas-burners in these streets could be replaced by incandescent gas-burners and lanterns (thus increasing the light fourfold) at a cost of £2 per post for the 68 posts, or £136 in all. The Committee feel that, in these circumstances, the Council would not be justified in giving its sanction to the loan applied for; but, before recommending that the application be refused, they would be prepared to consider any observations which the Borough Council may wish to make. They trust, however, that the application will be withdrawn." The Council passed a resolution to the effect that they received the communication with regret, but must proceed with their application.

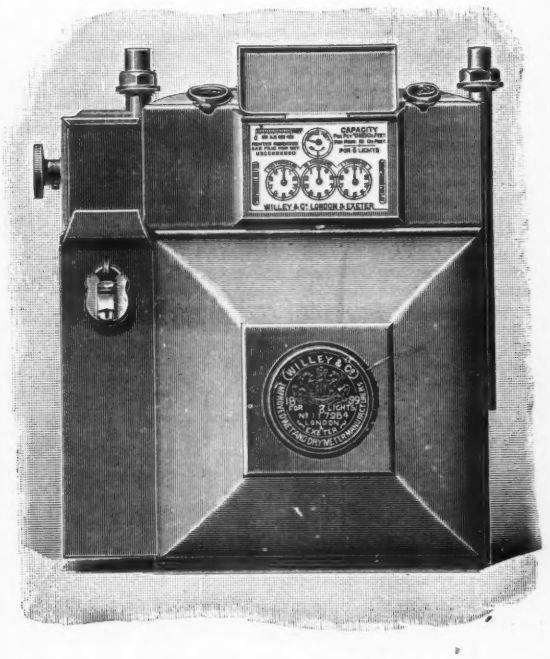
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

AGENTS FOR SCOTLAND:

D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

The Charge for Water in London.—Though, as will be seen from our "Parliamentary Intelligence," the Metropolitan Water Board (Charges) Bill has passed the Joint Committee of the two Houses, it is not yet safe, for no less than twelve members have given notice that on the report stage of the Bill they will move its recommittal. At the meeting of the London County Council last Tuesday, the Parliamentary Committee were authorized to endeavour to secure an amendment of the Bill so as to provide that annual value shall continue to be the basis of charge for water supply in the extra-London districts.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., on Monday last week, Mr. Alfred Richards placed three new issues of capital by order of Directors. Some 4 per cent. perpetual debenture stock of the Southend Water Company fetched £100 10s. to £101 10s. per £100; new £10 ordinary 7 per cent. shares in the Ascot District Gas and Electricity Company, on which 5½ per cent. has been paid, were sold at par; and a parcel of new £10 shares in the Londonderry Gas Company, carrying 7 per cent. dividend, at £12 each. Some consolidated ordinary stock of the Lea Bridge District Gas Company, bearing 6 per cent. dividend, fetched £120 per £100; and similar 10 per cent. stock of the Brentford Gas Company, on which a dividend at the rate of 12½ per cent. per annum has been paid, realized £245 per £100, *cum div.* as from Jan. 1 last. Some original stock of the Faversham Gas Company, on which 7 per cent. has been paid for the last three years, was sold on Wednesday in lots of £10, at from £10 7s. 6d. to £10 17s. 6d. per lot.

Troublesome Electric Lighting at Bristol.—At a recent meeting of the Bristol Sanitary Committee, Alderman Levy asked whether there was any information as to the whole of the electric lamps going out the previous night—the 500-candle power lamps. The Chairman replied that they had no official information. Alderman Levy said this was a very serious matter, and was continually happening. They paid for the full lighting of the streets; but on the previous night the lamps failed from half-past nine for the rest of the night, he supposed. The Chairman remarked that they were out at eleven, but they were on again soon after two o'clock. Alderman Levy added that it was a very strange matter; and he did not think they ought to continually pass it over. The police stated that it was dangerous to the inhabitants with the lights out. The lights were out almost continually. The Chairman replied that they had a full statement a fortnight ago, when Alderman Levy was not present. He thought this showed that on an average one lamp was out for a whole day every year.

Gas-Main for the Bermondsey Sewage-Pumping Station.—At the meeting of the London County Council last Tuesday, the Main Drainage Committee reported that the mains of the South Metropolitan Gas Company in the neighbourhood of the pumping-station now being erected at Shad Thames, Bermondsey, are not of sufficient capacity to enable the Company to supply, for short periods without notice, the large quantity of gas which will be required for the engines at the station. It was necessary, therefore, that a special main should be put down for the purpose; and the Committee were advised that the Company could be compelled to bear the cost. This main, which would be 9 inches in diameter, and was estimated to cost £2175, would be the property of the Council, but would be maintained by the Company. Should the Company at any time desire to make use of the main, they would not do so except on terms agreed with the Council. The Committee recommended that the estimate of expenditure on capital account of £2175, submitted by the Finance Committee in respect of the cost of laying the main, should be approved, and that expenditure on capital account not exceeding the sum named should be sanctioned. The recommendations were adopted.

East Surrey Water Company.—The report of the Directors of the East Surrey Water Company for the year to March 25, which was submitted at the recent meeting, stated that there was an addition of 712 customers during the year; while a further 6½ miles of mains were laid. The additional service storage reservoir works at Alderstead have been completed and put into use, thus very greatly increasing the service storage capacity for the low-service district, which covers the larger portion of the Company's area, and within which the borough of Reigate is situated. Next autumn, it is intended to augment the softening plant at the Purley pumping-station, in consequence of the increasing demand for water. The profit for the year was £27,162, which, with the balance of £2616 brought forward, made a total of £29,778. Out of this, the Board have placed £2000 to the renewal and contingency fund; and recommended dividends for the year, less income-tax, of 5 per cent. upon the preference shares, 7 per cent. upon the ordinary "B" shares, and 10 per cent. upon the original ordinary "A" shares—leaving a balance to carry forward of £3419. The report was adopted; and the Directors were subsequently authorized to raise additional capital. A vote of thanks to the staff was acknowledged by Mr. A. E. Cornewall-Walker (the Engineer, Manager, and Secretary).

The Girvan Gas Company was registered in Edinburgh last week, to take over the business of the Girvan Gas Light Company. The capital is increased from £4000 paid up to £8457. The shares are of £10 each. The public are not asked to subscribe.

The Gas Committee of the Coventry Corporation have considered a letter recently submitted to them from the Coventry Trades and Labour Council, suggesting that a reduction should be made in the charge for gas used through penny-in-the-slot meters; and they have resolved that they are unable to make any change.

As will be seen by an announcement which appears elsewhere, the East Surrey Water Company are about to sell by tender 600 ordinary £10 "B" shares, entitled to a dividend not exceeding 7 per cent. per annum. They are offered in lots of ten; and the last day for the receipt of tenders is Friday, the 26th inst., at 12 noon.

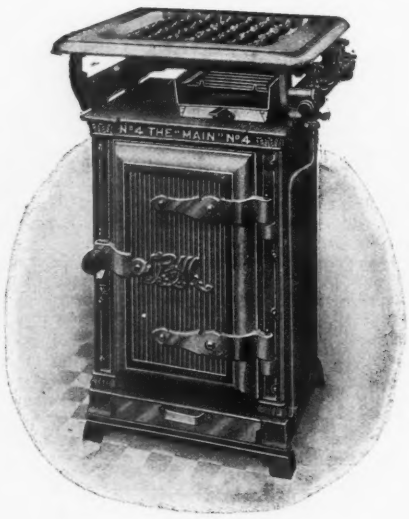
A Local Government Board inquiry has been recently held at Southend-on-Sea with reference to the application of the Town Council for sanction to borrow £1506 for the provision of additional sea-water mains. The extensions consist of 1800 yards of 6-inch and 272 yards of 4-inch pipe, together with stand-pipes for street watering and suitable connections for flushing the sewers.

SEASON 1907.

The "MAIN"

Gas

Cookers



High Grade Cookers.

Beautifully Enamelled.

R. & A. MAIN, LIMITED,

LONDON, GLASGOW, AND FALKIRK,

ALSO AT

BIRMINGHAM, BRISTOL, MANCHESTER, MELBOURNE, AND SYDNEY

The Richmond Gas Stove and Meter Company, Limited, have obtained the contract for the sole supply of all cookers for use with ordinary and slot meters in the district supplied by the Pontypridd Urban District Council.

When a gas-producer engine was being started at a woollen cloth factory at Trowbridge one day last week, an explosion occurred, severely injuring two men. Both, it is stated, had a narrow escape of their lives, as missiles were hurled in all directions.

Last week, while engaged in starting the suction-gas plant at the Central Wales Granite Works, at Llandrindod Wells, six men were overcome by an escape of gas, and were found in a precarious condition. Three of them were removed to the Cottage Hospital; but later reports stated that all were progressing favourably.

The report of the Directors of Messrs. Head, Wrightson, and Co., shows that the profit for the past financial year amounted to £26,602, to which has to be added a balance brought forward of £6562. After providing for interest on debentures and preference shares, the Directors recommended a dividend on the ordinary shares of 5 per cent., free of income-tax, with a carry-forward of £7114; and this was declared at the meeting last Saturday.

Owing to increasing business, the Edenbridge Gas Company find it necessary to enlarge their works; and ground has been purchased for the erection of a new retort-house. At an extraordinary meeting held for the purpose, it was resolved that the capital of the Company should be increased by the creation of another 2000 shares of £1 each, making the authorized capital £5000.

As the result of a gas explosion in connection with an engine at a Birmingham clothing establishment a few days ago, a porter named Avery was removed to hospital in a very serious condition. The explosion took place in the basement, where a large gas-engine used for generating the electric current for lighting purposes is situated. The engineer had just started the engine, which was apparently in perfect order, when there was a loud report. On going to see what was the matter, he found that the silencer, which receives the exhaust from the engine, had exploded, flinging the brickwork in which it was enclosed in every direction. A hurried examination of the premises revealed Avery lying among the *débris*.

The annual report of the Gas Committee of the Salford Corporation, to be presented at the next meeting of the Council, shows that there has been a considerable increase in the number of gas consumers. The sales went up 3·68 per cent. during the year.

The Hailsham Rural District Council have had their attention called to a local well, samples of water taken from which have been sent to the Medical Officer of Health, who has certified the water as being unfit for domestic purposes, as it contains paraffin. It was stated that the tenants had been using the water for some time as fuel. The Chairman remarked that a sample of the water was sent to him; and he had used it for a week to light his fires with. It was somewhat of a yellow colour; but he did not think it was paraffin. The well had been cleaned out on a number of occasions, and tons of water had been drawn; but it continued to be filled by the same liquid. There were two other wells near by; but these each contained pure water. The Inspector said that when the lid was removed from the well, a strong smell of paraffin came up.

At a meeting of the members of the City of Birmingham and District Coal Merchants' Association, held at the Birmingham Exchange last Thursday, it was unanimously resolved—"That in the opinion of this Association the proposed increase of rates for the carriage of coal, coke, breeze, and patent fuel issued from the Railway Clearing-House on June 12, is unjust in principle and the time of its issue inopportune, and that, therefore, it should be strenuously opposed." The proposal of the railways here referred to is to base their charges on the net ton of 20 cwt. Since 1895, the general rule (with varying exceptions for different parts of the country) has been for coal to be carried at 20½ cwt. to the ton. No proportionate decrease is to be made in the money charge, and the loss of ½ cwt. will be equivalent to an addition of 2½d. on every ton of coal carried. Coal traders are unanimously opposed to the alteration. The petition which the London Coal Merchants' Society are lodging with the Board of Trade will be presented in a few days. Apart from the point of the inadequacy of the notice given, which is considered a strong one, seeing that the traders' long contracts have only just been entered into, the alteration will be mainly opposed on the ground that it is equivalent to an increase of 2½ per cent. in the charges, and that it abolishes the custom of an allowance for the waste inseparable during transit and from shunting operations, &c.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CLERK (BRAZIL). Ceara Gas Company, London.
ASSISTANT MANAGER. Borough of Barrow-in-Furness. July 17, 1907.

Situations Wanted.

ASSISTANT TO ENGINEER. No. 4793.
SULPHATE OF AMMONIA LEAD WORK. No. 4791.

Plant (Second-Hand), &c., for Sale.

ENGINE AND EXHAUSTER, &c. Riddings Gas Company.
GAS-ENGINE, &c. "G. S.," c/o West End Advertising Agency.
STATION METER, ENGINE AND EXHAUSTER, PURIFIERS, SCRUBBERS, WASHERS, ENGINES AND BOILERS, AND OTHER GAS WORKS PLANT. Hastings Gas Company.

Stocks and Shares.

EAST SURREY WATER COMPANY. July 26.
UXBRIDGE GAS COMPANY. July 17.

Company Meeting.

EUROPEAN GAS COMPANY. Offices. July 16. 2.30 o'clock.

TENDERS FOR

Coal and Cannel.

BARNOLDSWICK GAS DEPARTMENT. Tenders by July 6.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by July 8.

Coal and Cannel.—*Continued.*

LINCOLN GAS DEPARTMENT. Tenders by July 15.
OLDBURY GAS DEPARTMENT. Tenders by July 13.
OMAGH GAS DEPARTMENT. Tenders by July 30.

Concrete (Reinforced) Floors.

COVENTRY GAS DEPARTMENT. Tenders by July 10.

Tar and Liquor.

ALTRINCHAM GAS COMPANY. Tenders by July 9.
ATHERTON GAS DEPARTMENT. Tenders by July 9.
COVENTRY GAS DEPARTMENT. Tenders by July 10.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 16.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
268,324	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
200,000	5	May 15	7	Bombay, Ltd.	6½—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	4½—5½	..	5 6 8
50,000	10	Feb. 28	14	Bourne- mouth Gas & Water 10 p.c. B 7 p.c. Pref. 6 p.c.	27½—28½	..	4 18 3
51,810	10	,,	7		16½—17	..	4 2 4
53,200	10	,,	6		15—16	..	3 15 0
380,000	Stk.	,,	12½	Brentford Consolidated	247—252	+2	4 19 2
300,000	,,	,,	9¼	Do. New	188—193	..	4 18 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	117—122	..	4 2 0
206,250	,,	June 13§	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
220,000	Stk.	Mch. 14	11½	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8¼	Do. A. Ord. Stk.	160—165	..	5 0 0
460,000	20	Apl. 11	10	British	41—43	..	4 13 0
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c.	119—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	90—93	..	4 16 9
500,000	10	May 15	7	Buenos Ayres (New) Ltd.	11—11½	..	6 1 9
250,000	Stk.	June 27	4	Do. 4 p.c. Deb.	93—95*	..	4 4 3
150,000	20	Mch. 14	8¼	Cagliari, Ltd.	25—27	..	5 17 10
100,000	10	June 13	10	Cape Town & Dis., Ltd.	11—13	..	7 13 10
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	8½—9½	..	4 14 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94—96*	..	4 13 9
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,443,280	Stk.	,,	5⅛	Commercial 4 p.c Stk.	105—108	..	4 16 4
500,000	,,	,,	5	Do. 3½ p.c. do.	102—105	..	4 15 3
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	112—117	..	5 11 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—141	..	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	103—105	..	3 16 2
486,090	10	Jan. 31	12†	European, Ltd.	23—24	..	5 0 0
354,060	10	,,	12†	Do. £7 10s. paid	17½—18½	..	4 17 4
15,203,110	Stk.	Feb. 14	4⅛	Gas- light and Coke 4 p.c. Ord.	93—95	+1½	4 12 7
2,600,000	,,	,,	3½		88—90	+1	3 17 9
3,799,735	,,	,,	4		102—105	..	3 16 2
4,193,975	,,	June 13	3		82—84	..	3 11 5
258,740	Stk.	Mch. 14	5	Hastings & St. L. 3½ p.c.	95—100	..	5 0 0
82,500	,,	,,	6½	Do. do. 5 p.c.	116—119	..	5 9 3
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	15—20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental	170—173	+1	4 12 6
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
184,602	Stk.	Mch. 14	6	Lea Bridge Ord. 5 p.c.	110—120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108—110*	..	3 12 9
561,000	Stk.	Feb. 28	10	Liverpool United A	221—223	−1	4 9 8
718,100	,,	,,	7	Do. B	163½—164½	..	4 5 1
144,140	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	June 27	5	Malta & Medn., Ltd.	4—4⅛*	..	5 11 1
560,000	100	Apl. 2	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 30	3½	Monte Video, Ltd.	10½—11½	..	6 1 9
1,775,892	Stk.	Feb. 28	4⅝	Newc'tle & G'tesh'd Con.	106—108	+1	4 5 8
406,025	Stk.	June 27	3½	Do. 3½ p.c. Deb.	94—95*	..	3 13 8
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd.	143—148	..	5 8 1
60,000	5	Mch. 27	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	May 15	7	Primitiva Ord.	6⅞—7½	,,	4 16 7
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5—5¼	+⅛	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
1,000,000	10	Apl. 26	8	River Plate Ord.	12¾—13½	..	6 0 9
312,650	Stk.	June 27	4	Do. 4 p.c. Deb.	93—95*	..	4 4 3
250,000	10	Mch. 27	8	San Paulo, Ltd.	12½—13	..	6 3 1
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mch. 14	10	Sheffield A	245—247	..	4 1 0
209,984	,,	,,	10	Do. B	245—247	..	4 1 0
523,500	,,	,,	10	Do. C	245—247	..	4 1 0
70,000	10	June 13	10	South African	15—16	..	6 5 0
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	117—120	−1	4 11 8
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	83—85	..	3 10 7
201,720	Stk	Mch. 14	8	South Shields Con. Stk.	157—159	..	5 0 8
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	117—121	..	4 10 11
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 10 11
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	May 15	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Feb. 28	6½	Tottenham A 5 p.c. and B 3½ p.c.	123—126	..	5 3 2
398,940	,,	,,	5		100—103	−½	4 17 1
137,500	,,	June 27	4	Edmonton 4 p.c. Deb.	99—101*	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10¼—10¾	..	7 8 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Feb. 14	8	Wands- A 5 p.c.	—	..	—
255,636	,,	,,	6½	worth B 3½ p.c. and C 3½ p.c.	131—136	−2	4 15 7
75,000	,,	,,	5⅝		—	..	—
79,416	,,	June 27	3	Putney 3 p.c. Deb. Stk.	77—80*	..	3 15 0
845,872	,,	Feb. 28	5½	West Ham 5 p.c. Ord.	102—105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	100—103*	..	3 17 8

Prices marked * are "Ex div." † Next dividend will be at this rate.

LEAFLETS FOR DISTRIBUTION.

"ILLUMINATING TRUTHS FOR HOUSEHOLDERS."

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "ENAMEL." National Telephone 1759.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 7, Park Square, LEEDS.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim Street Chambers, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

DELLWIK-FLEISCHER WATER GAS.
BLUE WATER GAS, CARBURETTED WATER GAS, SELF-CARBURETTING.
FOR list of towns in which Plant has been Installed, see advertisement in the "JOURNAL" for June 25 last, p. 881.
The DELLWIK-FLEISCHER WATER GAS SYNDICATE, Belgravia Chambers, 72, Victoria Street, Westminster, LONDON, S.W. Telegraphic Address "Dellwik, LONDON."

THE KEITH LIGHT.
4000 INSTALLATIONS NOW IN USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

INCREASE YOUR MAKE.
SEND for Particulars of the "RAPID" Carburettor. Why be short of Gas when you can stretch the make from 1000 to 2000 cubic feet per ton, without any difficulty?
BIGGS, WALL, & CO., 13, Cross Street, Finsbury Pavement, LONDON.

TEMPERLEY TRANSPORTERS
FOR Rapid and Economical Handling of Coal and Coke in Gas-Works.
Next Illustrated advt. will appear on July 16.
TEMPERLEY TRANSPORTER COMPANY,
72, BISHOPSGATE STREET WITHIN, LONDON, E.C.
Telephone: 865 LONDON WALL. Telegrams: "TRANSUMO."

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

BY adopting Cripps's Bye-Pass Valves inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron Works, Donnington, near Newport, SHROPSHIRE.

SULPHATE of Ammonia Lead Work, Labour only, done on reasonable terms by a good quick LEAD BURNER, own Tools, Machine, &c. Work Guaranteed.
Address No. 4791, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG Man (Age 21), who has just completed his Articles in a Medium-Sized Gas-Works, desires a Position as ASSISTANT TO ENGINEER of another Gas-Works, either at home or abroad, to gain further Experience. Accustomed to Water-Gas Plant.
Address No. 4793, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF BARROW-IN-FURNESS.
THE Corporation invite Applications for the Appointment of ASSISTANT-MANAGER of the Gas and Water Works. Salary, £130 per Annum.
Applicants must be competent Draughtsmen, and have a thorough knowledge of Gas Making and Main and Service Laying.
Applications, in own hand-writing, stating Age, Experience, present and previous occupation, and accompanied by *copies* of not more than Three recent Testimonials, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Assistant-Manager," and delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Wednesday, the 17th of July, 1907.
Canvassing members of the Council will be a disqualification.
By order,
C. F. PRESTON,
Town Clerk.
Town Hall, Barrow-in-Furness.

THE Ceara Gas Company, Limited re- quire a CLERK at once at Ceara (Brazil). Age not under 21. Knowledge of Gas Manufacture desirable. Three years' Engagement. Passage out and home free. Progressive salary—£16 per Month first Year to a thoroughly qualified applicant.
Apply, by letter only, in first instance, stating Qualifications and Employment during last three Years, and enclosing *copies only* of Three recent Testimonials, to the CEARA GAS COMPANY, LIMITED, 9, Queen Street Place, LONDON, E.C.

FOR SALE—A Combined Horizontal STEAM-ENGINE and EXHAUSTER, with Inlet and Outlet Wheel Valves, Foundation Stones, Lubricators, &c. Maker, Bryan Donkin. Capacity, 10,000 cubic feet per hour. Excellent Condition. Removing to make room for larger Exhauster.
Apply to the RIDDINGS DISTRICT GAS COMPANY, Pye Bridge near ALFRETON.